DESIGN, CONSTRUCTION, OPERATION OF METAL-WORKING AND ALLIED EQUIPMENT

MACHINERY

OCTOBER, 1942

November MACHINERY will be known as the "Ships for Victory" number. It will contain information especially gathered by MACHINERY'S staff, with the cooperation of the United States Maritime Commission, on the methods adopted in the shipyards and shipbuilding plants that are farthest ahead in the development and application of mass-production methods in ship and marine equipment building. The material presented will represent a summary of the best practice as applied to mass-production in shipbuilding. In addition to the special articles on shipbuilding, there will be a variety of other material of interest to the designer and production executive, including the regular departments featuring Design of Tools and Fixtures, Shop Equipment News, and Materials of Industry.

Volume 49
Number 2

PRINCIPAL CONTENTS OF THIS NUMBER

For Complete Classified Contents, See Page 232

Cartridge Links for Machine Guns and Automatic Rifles
By Freeman C. Duston 123

Rolled and Cast Kirksite in Airplane Plants
By William W. Broughton 139

Special Equipment Increases Production of High-Speed Assembly Press 148

Automobile-Body Stamping Plant Builds Boring Mills for Tank Production 149

Rifling Machine-Gun Barrels by Broaching 157

Editorial Comment 162
Too Much Regulation is Seldom a Sign of Efficiency—Fair Play is All that Industry Asks of Government

Care and Maintenance of Portable Pneumatic Tools 165

The Douglas Blackout Plant Builds for Victory
By Ray A. Steinbauer 170

The Twenty-Fourth Annual National Metal Exposition 173

Condensed Review of Some Recently Developed Materials 174

Cemented-Carbide Tipped Tools Increase Efficiency in Railroad Maintenance Shops 186

Lodge & Shipley Completes Fifty Years of Lathe-Building 189

Machine Tool Industry Honored by Army-Navy Awards 212

DEPARTMENTS

Engineering News Flashes 160

Ingenious Mechanical Movements 163

Design of Tools and Fixtures 167

New Trade Literature 191

Shop Equipment News 195

News of the Industry 218

Product Index 388-409
Advertisers Index 411-412

TOTAL DISTRIBUTION
22,325

PUBLISHED MONTHLY BY
THE INDUSTRIAL PRESS
148 Lafayette Street New York

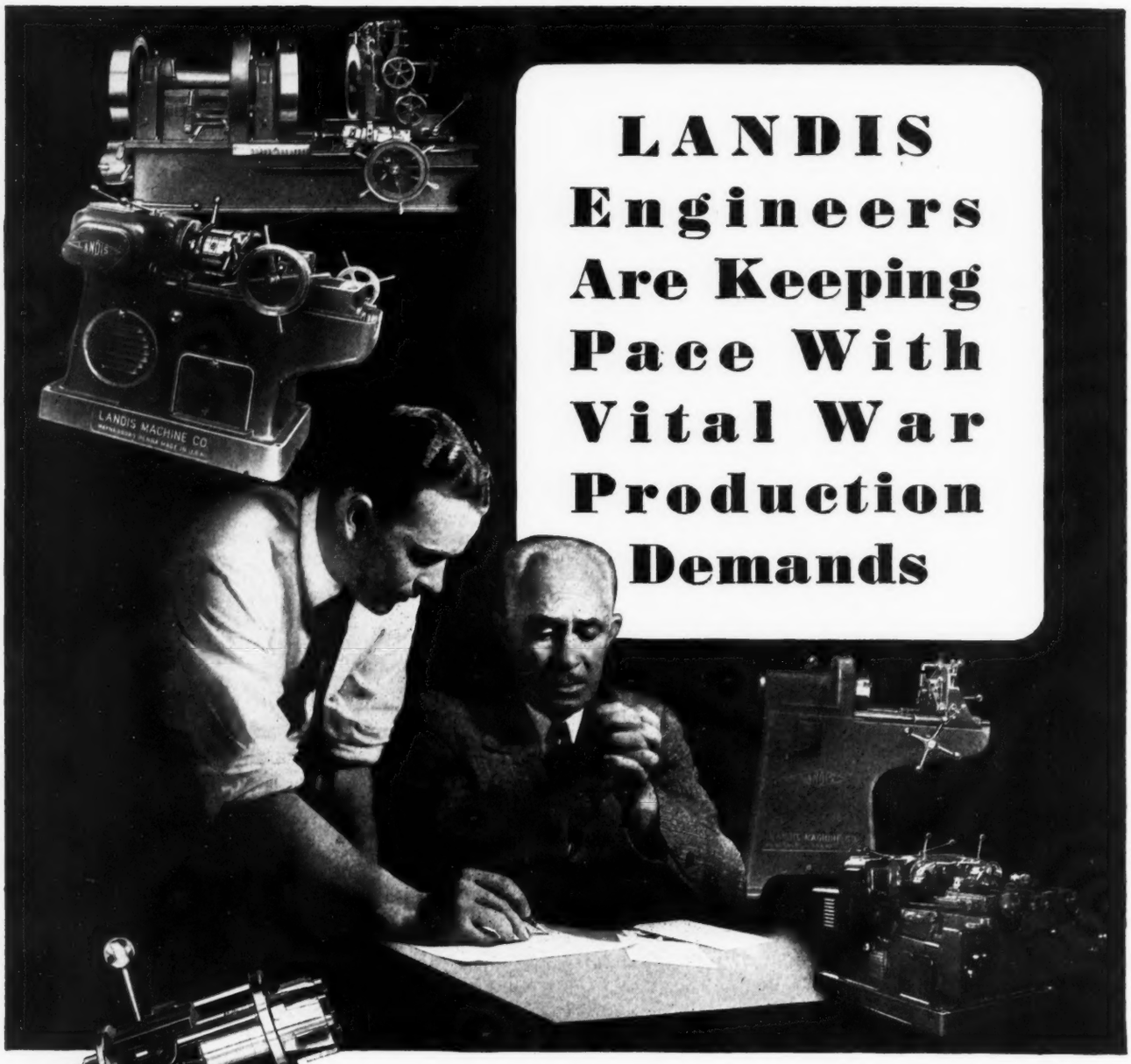
ROBERT B. LUCHARS ..... *President*
EDGAR A. BECKER..*Vice-pres. and Treasurer*
ERIK OBERG ..... *Editor*
FRANKLIN D. JONES....*Associate Editor*
CHARLES O. HERB ..... *Associate Editor*
FREEMAN C. DUSTON ...*Associate Editor*
HOLBROOK L. HORTON...*Associate Editor*

BRIGHTON, ENGLAND:
MACHINERY, 17 Marine Parade

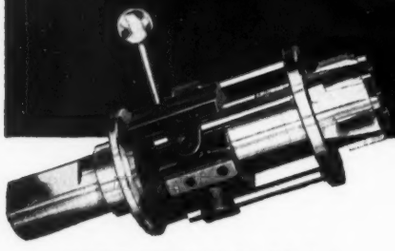
SUBSCRIPTION RATES: United States and Canada, one year, $4; two years, $7; three years, $8 (for Canada add 25 cents per year for war tax); foreign countries, $7 a year. Single copies, 40 cents. Changes in address must be received by the fifteenth of the month to be effective for the next issue. Send old as well as new address.

Copyright 1942 by The Industrial Press.

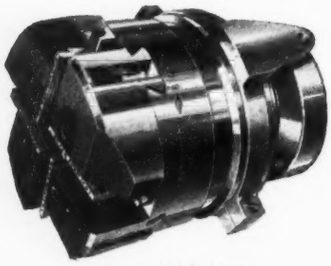
Entered as second-class mail matter, September, 1894, at the Post Office, New York, N. Y., under the Act of March 3, 1879. Printed in the United States of America. Member of A.B.P. Member of A.B.C.



LANDIS Engineers Are Keeping Pace With Vital War Production Demands



LANDIS Style LT Collapsible Tap



The LANCO Head

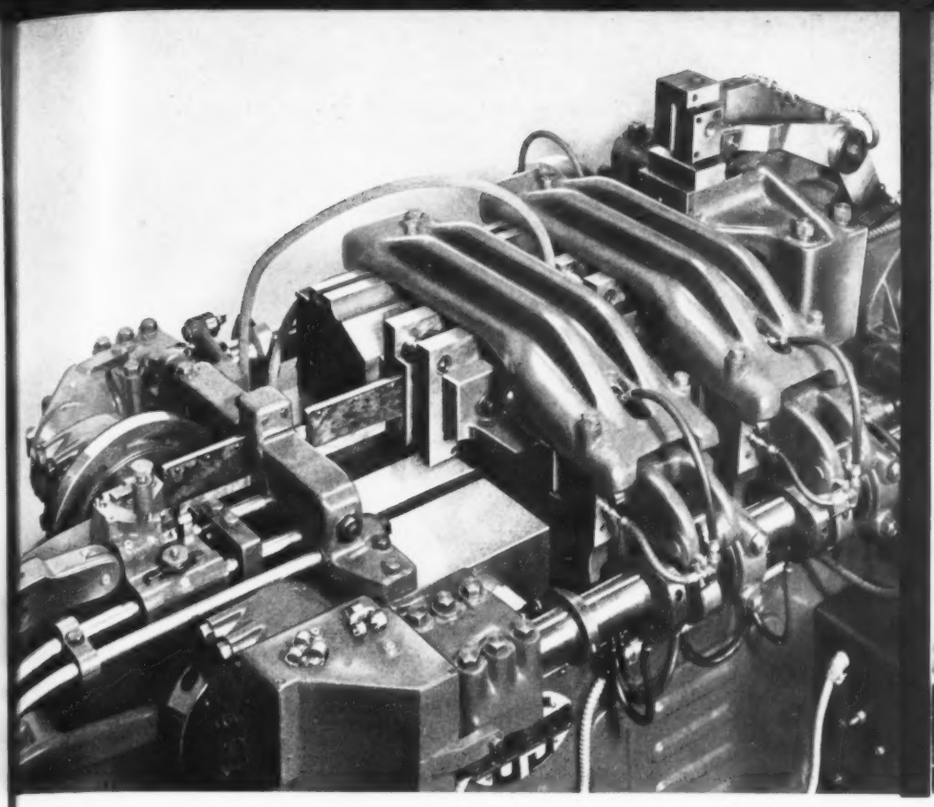
More Production—Greater Accuracy is uppermost in the minds of LANDIS Engineers as they methodically streamline the LANDIS LINE—gearing it to the war effort.

Odd machine sizes are eliminated, old type Heads discontinued—New Machines standardized and geared to higher speeds—all without sacrifice in efficiency for the user—in an effort to keep pace with vital War Production demands.

LANDIS REG. U.S. TRADE MARK PAT. OFF.

LANDIS MACHINE COMPANY
WAYNESBORO, PENNA., U. S. A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS



Wide World Photos

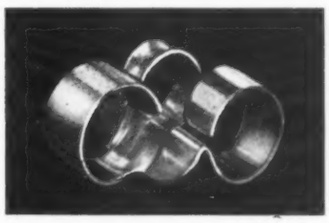
Cartridge Links for Machine Guns and Automatic Rifles

Producing the Ingeniously Designed Metal Links that are Assembled with Cartridges to Form Flexible Metallic Feeder Belts for Machine Guns and Automatic Rifles

By FREEMAN C. DUSTON

Approved for Publication by the War Department

METAL links, like the one shown below, can be assembled with a cartridge by placing the single loop of one link between the two loops of another and inserting the cartridge through the three loops thus aligned. The cartridge is a tight fit in the two loops, but a loose fit in the single loop; thus, the cartridge and links form a hinge-like assembly. Any number of links can be assembled in this way to form machine-gun feeder belts containing the desired number of rounds or cartridges.



The gunner in the view at the right in the heading illustration is shown loading a belt composed of links and cartridges into a metal box in preparation for target firing. The miles of cartridge belts of this kind required by our armed forces are, of course, assembled or loaded by means of fixtures or loading equipment.

Cartridges are fed to the machine gun from the metal-link belt, the same as from the familiar canvas belt; but each time the gun mechanism withdraws a cartridge from the link belt, one of the links is released and dropped off. Thus, the term "disintegrating metallic-link belt" is applied to belts of this type. The disintegrating metallic belt is perhaps one of the most impor-

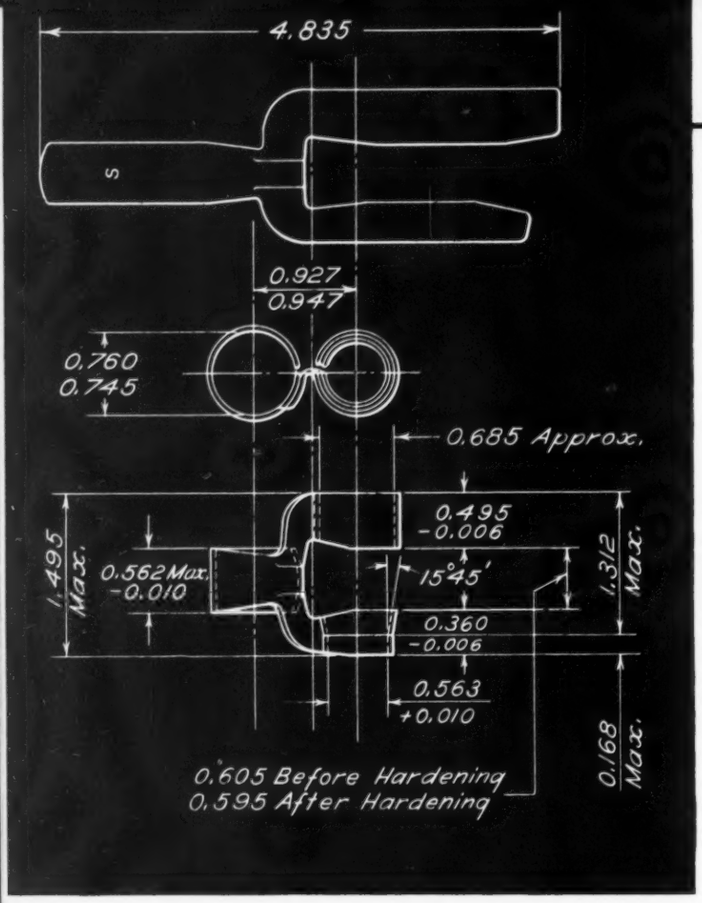


Fig. 1. Details of 0.50-caliber Metal Cartridge Link Produced on Machine Shown in Figs. 3 and 4

tant developments in machine gun design since 1885, when Hiram Maxim, the American inventor, patented the first fully automatic machine gun. Although rapid-firing machine guns had been previously designed and built, some form of crank- or other hand-actuated mechanism was required for their operation, whereas Maxim's machine gun utilized the recoil from the fired cartridge to eject the empty case, reload, and fire.

This cycle of operations was repeated automatically and continuously at a rapid rate so long as the trigger was held back by the finger, as in the case of machine guns used in the present war. The single barrel, kept cool by a surrounding jacket filled with water—a method also used today—was a feature of Maxim's invention, as was also the canvas-belt method of feeding the ammunition to the gun. This belt feed proved a vast improvement over the uncertain gravity or hopper feeds employed on previous hand-operated rapid-firing guns.

However, the canvas feeding belt, although still used extensively, is rapidly being replaced by the disintegrating metallic-link belt, which was developed some years ago at one of our arsenals to overcome certain disadvantages of the canvas or fabric belt. In the light of recent happenings, we can consider this a very important and fortunate development. We are also fortunate in having available highly developed machines and equipment, such as the multi-slide machine in the view at the left in the heading illustration and in Figs. 3 and 4, which can be assembled into an efficient production line for manufacturing the metal links, as has been done at one of the plants of the Stanley Works where the methods here described are in use.

Cartridge links of the disintegrating metallic-belt type shown in the accompanying illustrations are made for both 0.30- and 0.50-caliber machine-gun ammunition. The links for these two calibers are similar in shape, differing only in size, thickness of metal, and minor details. The methods employed in producing the two sizes of links are practically the same. The procedure and equipment here described are used in producing links for the 0.50-caliber cartridges.

The somewhat irregular and complicated shape of the links and the close tolerances required, as indicated in Fig. 1, demand exceptional accuracy in piercing, cutting, and forming the links, and in heat-treating them, as well as in subjecting each link to precision tests and inspection before packing for shipment.

A large number of comparatively simple individual dies were employed in making the first experimental links. Such methods were, of course, too slow and expensive to meet our tremendously expanded wartime needs. Once the advantages of metallic-link belts were fully realized and the design of the links established, the development of dies for accurate, faster production of the links got under way.

In the production line here described, some of the most recently developed dies for producing the 0.50-caliber links are employed in automatic multi-slide cutting, piercing, and forming machines like those shown in the heading illustration and in Figs. 3 and 4. These machines are made by the U. S. Tool Company, Inc., the particular machine shown in Fig. 3 being one of the most recent additions to the cartridge-link production line of the Stanley Works. The illustration shows this machine operating on a test run of links shortly before being placed in the regular production line, where it is arranged to

drop the links on a traveling belt of the conveyor system.

Dieing machines made by the Henry & Wright Mfg. Co. are also used in this production line. The production of cartridge links on these machines has previously been described in MACHINERY.

The conveyor system automatically takes the links through degreasers and heat-treating furnaces to the tumbling machines, and thence to the Parkerizing tanks and oiling unit, from which they are transferred to the conveyor belt of the final inspection and packing line.

The 0.50-caliber links are made from cold-rolled steel stock, about 0.040 inch thick by 1.415 inches wide, which is brought to the multi-slide machine, equipped as shown in Fig. 3, in coils weighing approximately 200 pounds. The coil of stock is placed on an automatic horizontal reel to the right of the machine (not shown in the illustration). The motor-driven reel, also made by the U. S. Tool Company, Inc., automatically unwinds the stock from the coil, so that all unnecessary strain is removed from the feeding mechanism of the multi-slide machine.

The positive slide-feed at *A*, Figs. 3 and 4, reciprocated by link *B*, Fig. 4, connected to an eccentrically operated lever, draws the flat stock *C*, Fig. 3, through the straightener shown at *D*, Fig. 4. The stock is advanced 3.042 inches at each forward stroke of the feed-slide, which operates between definite stops. Positive means are provided to prevent the stock from moving on the return stroke of the feed-slide. This is a very important feature in maintaining the high degree of accuracy required in performing operations on the blank at different positions as it is advanced through the machine.

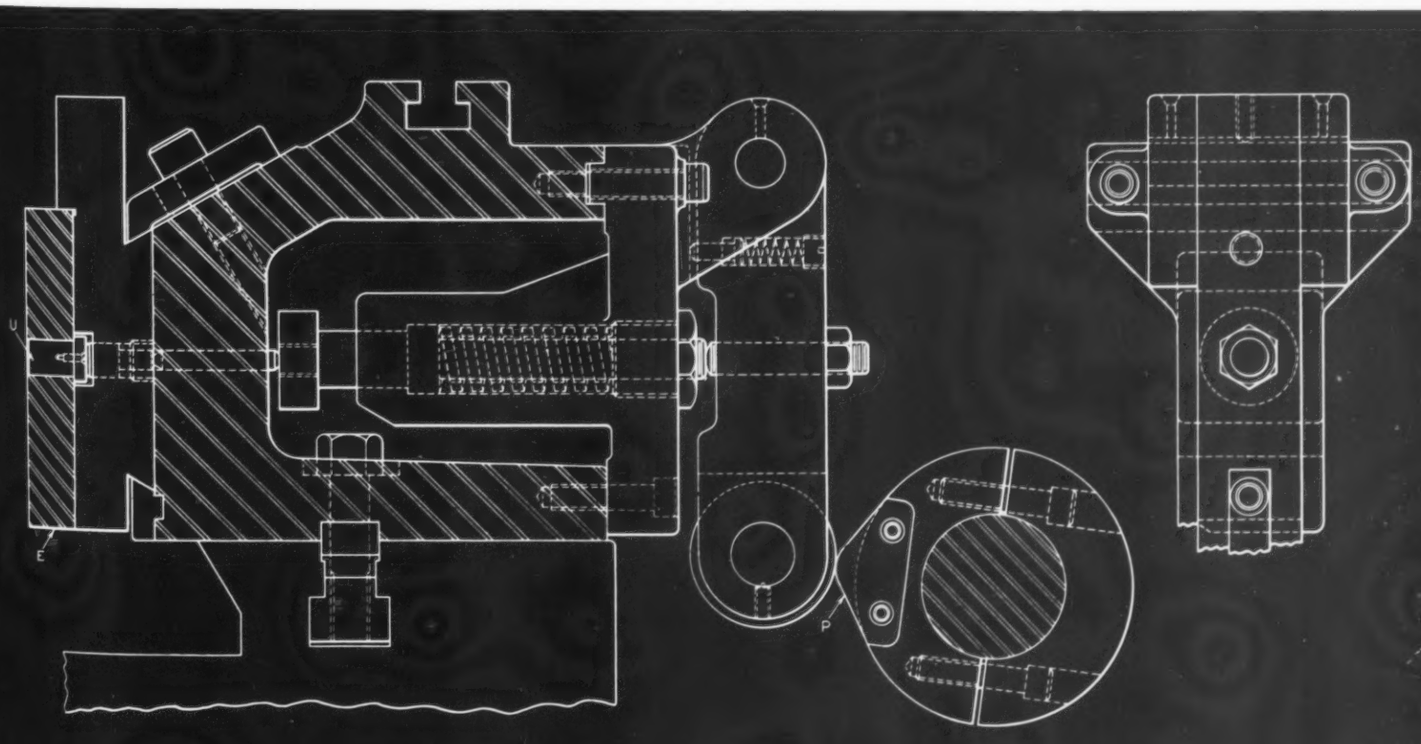
From the time the stock enters the die seen at *E* in Figs. 3 and 5, which performs the first operation of piercing two holes *J*, Fig. 5, until the first completely formed link drops into the chute at the rear of the machine, the feed-slide makes ten strokes. Thereafter, a completely formed link is produced at each feeding stroke.

A remarkable feature of the tool equipment for this job is the extremely small proportion of stock converted to scrap. As shown in Figs. 5 to 8, inclusive, the full width of the stock is utilized, no trimming being done on either edge of the widest part, while the part of the blank that is formed into the larger single loop extends back between the ends or portions of the blank from which the two smaller rings are formed.

As stock *C*, Fig. 3, is advanced by feeder *A*, it enters the first die set composed of die member *E* and punch member *F*. The two members of this die are also shown in Figs. 5 and 9. The same parts or details in the different views are

PAGE 125

Fig. 2. Combination Spring and Positive Knock-out for Operating Knock-out Pad U of Die Illustrated in Fig. 5



indicated by the same reference letters. The die members are shown assembled and mounted in their vertical operating positions in Fig. 3.

Die member *E*, as shown in the upper view of Fig. 9, is secured to the back-plate of the machine and remains stationary, while punch member *F* is secured to the front slide, which is operated by cam *G*, Fig. 4.

The stock is fed into the slot under stripper plate *H*, Fig. 5, as indicated at *C* in Fig. 9. The lower edge of the stock is positioned by a stationary guide between the stripper and the die proper. The stock is pressed against this fixed guide by a spring-backed guide which exerts a downward pressure on the upper edge of the stock.

Starting at the first position, two holes *J*, Fig. 5, are pierced at the first stroke of the slide which actuates punch member *F*. The stock, as shown in this illustration, has been removed from the slot under the stripper plate and so positioned that the pierced holes *J* are located approximately above the view of the punches in member *F* and below the holes in the stripper plate of the die through which the punches pass when members *E* and *F* are assembled. This arrangement permits the reader to easily compare the die and punch members directly with the work they perform on the strip.

The slugs from pierced holes *J*, indicated by the cross-sectioned areas in the first-position station, Figs. 6 and 9, pass out through an opening in the back-plate and down through chute *I* shown in Fig. 3. The letter "S" which identifies the manufacturer of the link is also stamped in the first position by the punch shown just to the right of the piercing punches in Figs. 5 and 9.

On the succeeding feeding stroke, the stock is carried into the second position for cutting or slitting, as indicated at *K*, on the second stroke of punch member *F*. A pad *U* (Figs. 2, 5, and 9), which is the same shape as the cutting punch located in member *F*, is operated by cam *P* (Figs. 2 and 3) to force the cut part of the stock back out of the die member, so that the stock can again be fed forward.

The third feeding movement carries the stock into position for blanking out the scrap pieces *L* and *M*, Fig. 6, on the third stroke of the punch member. In this position, a small punch *N* (Figs. 5 and 9) produces an offset or bend in the blank. This offset is shown more clearly at *O*, Fig. 5, in the fourth position. In this position, a blast of air from a hose blows the scrap pieces *L* and *M* down into a chute shown at the left of chute *I*, Fig. 3. The offset produced by punch *N* serves to loosen the scrap pieces in the stock and provides sufficient space to permit them to be blown down clear of the stock by the air blast, which is controlled by a cam-operated valve at the rear of the machine.

It will be clear from the view of the stock shown between the punch and die members, Fig. 5, that when all operations performed on the first blank by this die unit have been completed, each succeeding stroke of the punch member will perform piercing, cutting, and scrap-blanking operations on three succeeding blanks simultaneously.

No operations are performed on the blank at the fifth and sixth positions, the stock simply being carried into the die set shown in Figs. 7 and 10 on the sixth feeding stroke. Member Q of this die set is secured to the back-plate, as

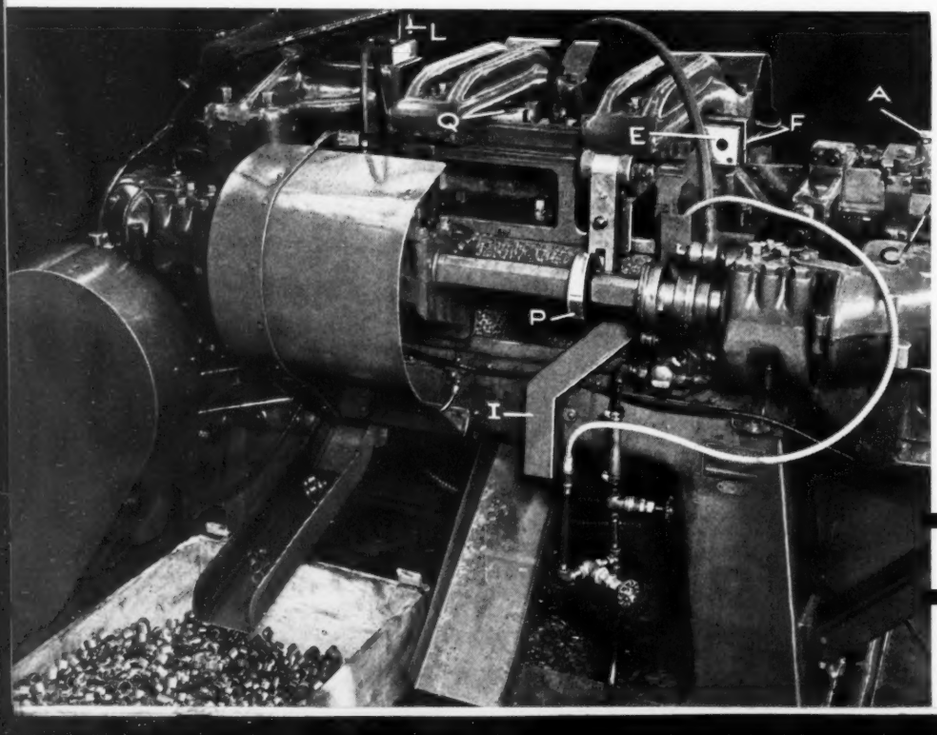


Fig. 3. Rear View of Multi-slide Automatic Cutting, Piercing, and Forming Machine Used to Produce Cartridge Link Shown in Fig. 1

indicated in Figs. 3 and 10. The stock is fed into the slot under stripper plates *R*, Fig. 7, the guides for the edges being of the fixed type. At the seventh position, the punch performs a radius preforming operation that also produces an offset in the central portion of the blank, as indicated at *T*, Fig. 7, and as shown in the plan and side views *T* and section *X–X*, Figs. 8 and 10.

In the eighth position, the blank immediately ahead, in the ninth position—assuming now that there is a preformed blank ahead of the one in the eighth position—is cut off by punch *U*, Figs. 7 and 10. This punch is operated by an auxiliary slide at the rear of the machine, and is advanced through a slide groove in the back-plate after the cutting-off dies *V* in the punch member have advanced to bring the cutting edges into the cutting-off position. Punch *U* is supported in its groove in the die member by guide plate U_1, Fig. 10.

The scrap stock removed between the cutting edges of dies *V*, Fig. 7, by the cut-off punch *U*, is indicated by the cross-sectioned area S_1 in the eighth position, Figs. 8 and 10. The punch member of the die shown in Fig. 7 is operated by cam *Z*, Fig. 4. When the machine is in operation, one blank is preformed in the seventh position while another preformed blank in the ninth position is being cut off by the punch located in the eighth position. On the ninth feeding stroke, the preformed blank is advanced from the eighth to the ninth position indicated in Figs. 8 and 10.

The preformed blank, advanced to the ninth position for the semi-final forming operation, is shown at *A*, Fig. 11. In this position, the end of the blank comes in contact with a lever *K* that actuates a micro-switch which is normally "off," closing the circuit as required at this point in the cycle to keep the machine runing. A micro-switch that is normally "on," at the front of the machine, is actuated by a cam on the front camshaft to break the circuit while the switch actuated by lever *K* is engaged. Thus, if the stock should become jammed, or for any reason fail to feed forward, the machine will be stopped automatically.

The preformed blank in the eighth position, in which the blank is severed from the strip, is shown at *B*. Just before blank *A* is severed from the succeeding blank *B*, the front forming punch unit or tool *F* advances far enough to permit the spring-backed forming punch *D* (see also Fig. 10) to come in contact with the blank and hold it securely against the forming mandrels *C* and *E*. The forming ends of the front tool unit *F* and the rear unit *R* are shown in Fig. 12.

The forming tools shown in Figs. 10, 11, and 13, together with a supporting unit *G*, Fig. 10, which is attached to a slide operated at right angles to the slides that actuate forming tools *F* and *R*, accomplish the seemingly impossible in forming blank *A*, Fig. 11, into a complete cartridge link, as shown at *W*, Fig. 12, in two strokes of the slides. On the first forward stroke of tool *F*, as the unit advances, forming punch *D* recedes into the holder.

The formed part *H* of punch *D*, in contact with the preformed radius indicated at *T* (Figs. 8 and 10), serves to hold the blank in place. Block *I*, which fits into the space at *J*, Fig. 11, between the ends of the blank, keeps the blank

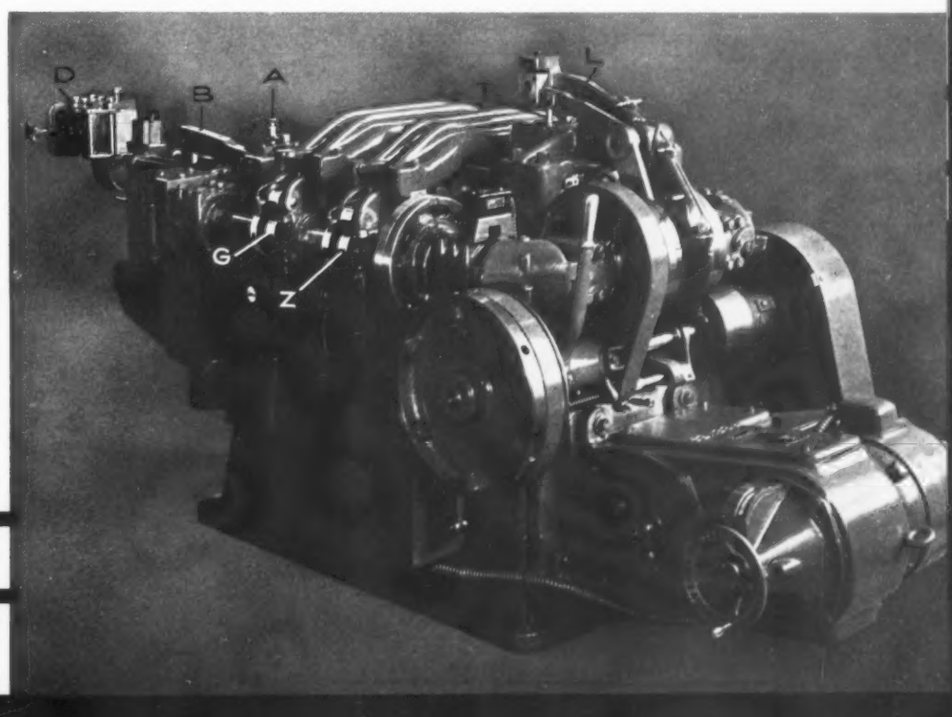


Fig. 4. Front View of Multi-slide Machine (a Rear View of which is Seen in Fig 3) Equipped for Production of 0.50-caliber Cartridge Links

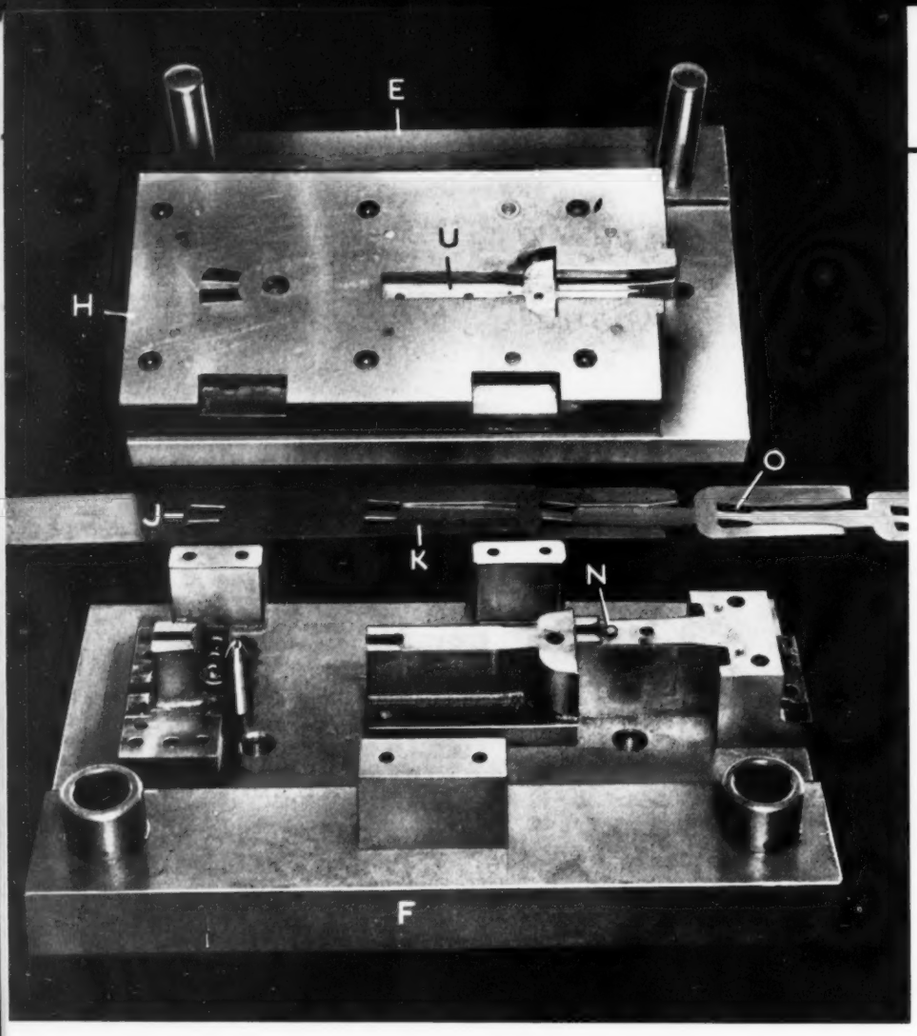


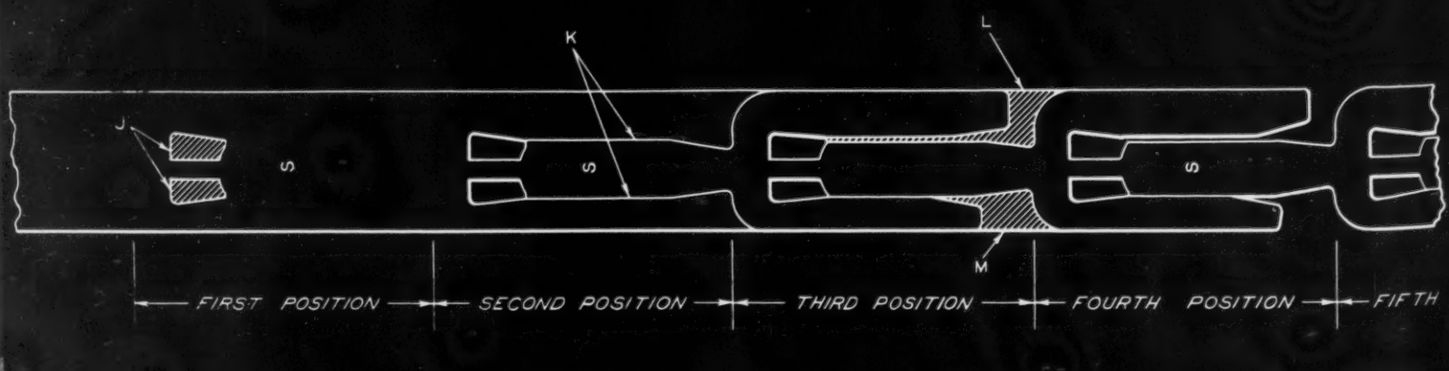
Fig. 5. (Left) Die Set with Punch Member F Removed and Stock Placed between Two Members to Show Piercing, Slitting, and Blanking Work Performed on the Multi-slide Machine by This Unit

Fig. 6. (Below) Stock Layout Showing Work Performed in Three Positions of Die Set in Fig. 5

properly aligned. As punch unit F, Fig. 12, continues to advance, the receding spring-backed forming tool D comes against a solid stop in the holder. The radius-forming surfaces of tool D are now aligned with those of the solid tools at K and L to complete the radius-forming tool. The radius-forming surface at K forms end M of the blank (Figs. 10 and 13) around mandrel C (Figs. 10 and 11), while the radius surface at L, Fig. 12, forms the two ends N and O, Fig. 13, around mandrel E. This forms the blank to the shape seen at B_1, Figs. 10 and 13.

At this point, the rear tool R moves in and curls the ends of the work around forming block P at the rear of mandrels C and E. The formed link is shown in solid outline at C_1, Fig. 10, while block P is shown in cross-section. This completes the semi-final forming operation in the upper level of the tools shown in Fig. 12, the link now having the form seen at S, Fig. 12, and at C_1, Fig. 13.

Referring to Figs. 10 and 12, one can readily visualize the powerful action of the die units F and R advancing toward each other to form the



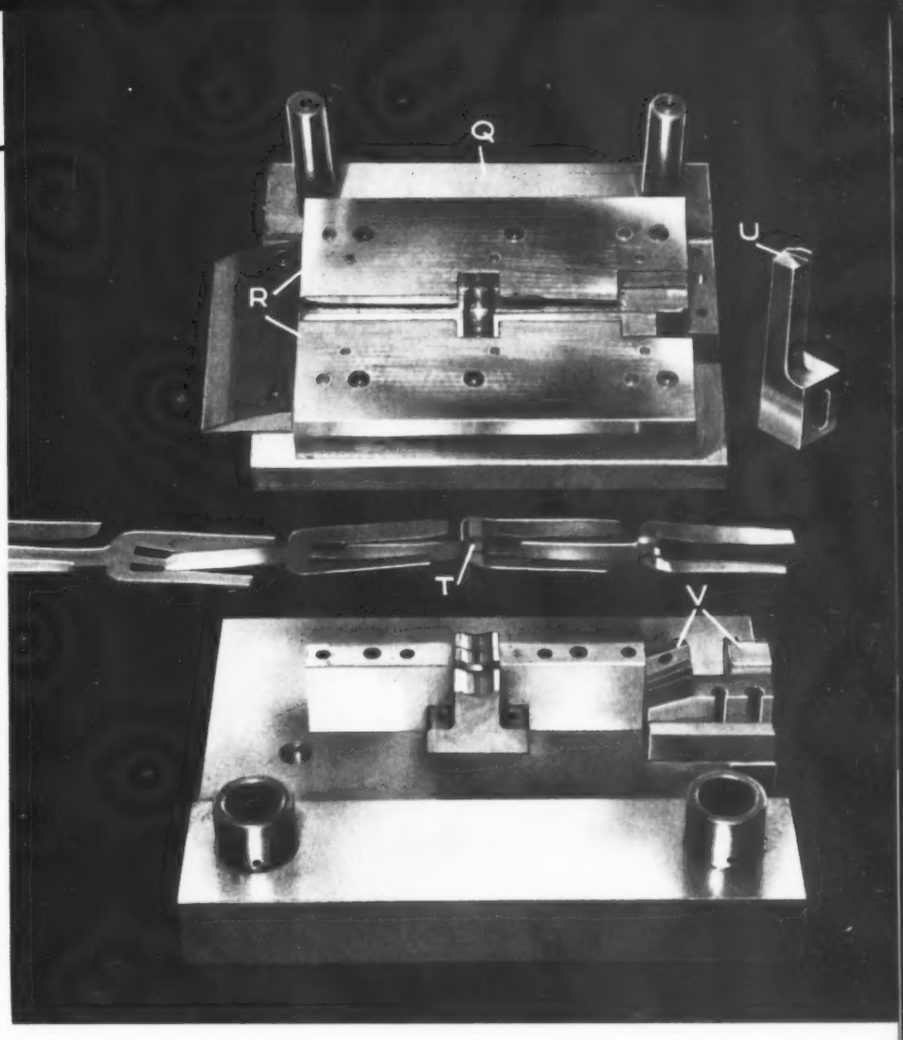


Fig. 7. (Right) Die Set Shown in Machine at Q, Fig. 3, with Punch Member Removed and Stock Placed between Two Die Members to Show Forming and Cutting-off Work Done by This Unit

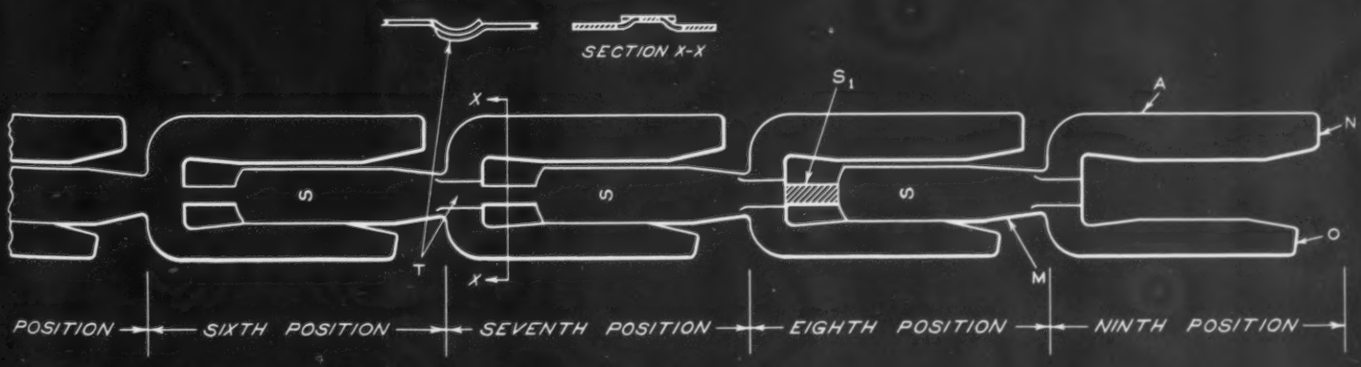
★

Fig. 8. (Below) Stock Layout, Showing Work Performed in Die Set Illustrated in Fig. 7

blank around mandrels C and E and block P. Again referring to Fig. 12, let us assume that the semi-formed link S is raised vertically, so that the slot between the two fingers on the left side of the partly formed link is in line with block I and that the finger to the right is at the same height as forming punch K. Now, by pushing the blank against punch D with sufficient force to cause the punch to recede, it will be obvious that formed link S can be fitted nicely into the contours of the upper portion of unit F in which it was formed.

It may be well to note here that there is a slot in the rear unit R into which block I fits. Block I serves to accurately align the punch units F and R, as well as to hold the link in the correct position for the forming operation. The radius-forming surfaces of unit R, opposite L and K of unit F, are set back from the center line of the forming mandrel to accommodate block P (Figs. 10 and 13).

For the final forming, the work is transferred to the lower level of the front and rear forming tools F and R by stripper T_1, Fig. 11.



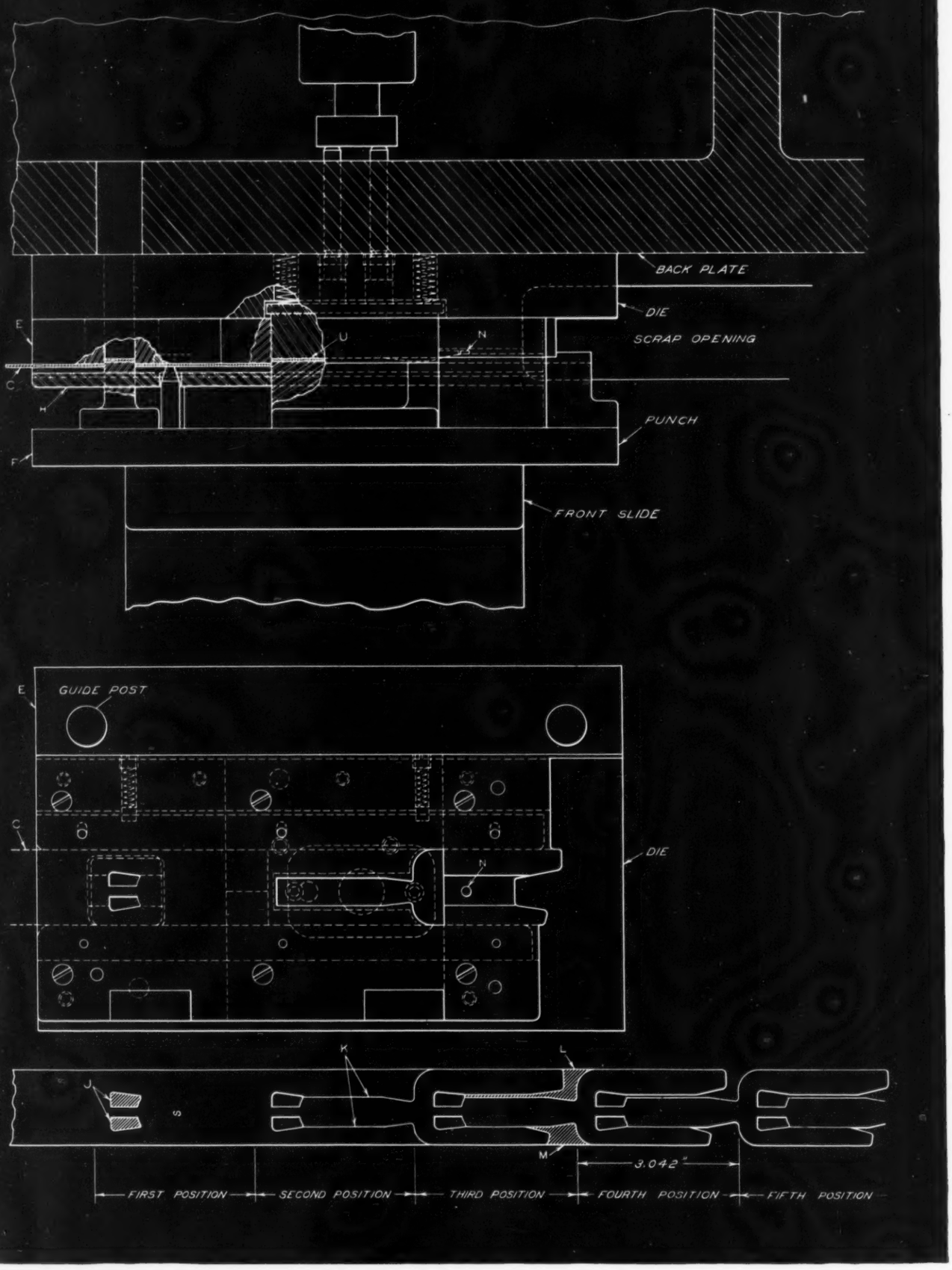


Fig. 9. View of Punch and Die Members Shown in Fig. 5 Assembled to Back-plate of Machine, Plan View of Die Member, and Stock Lay-out, Showing Work Performed in First Three Positions

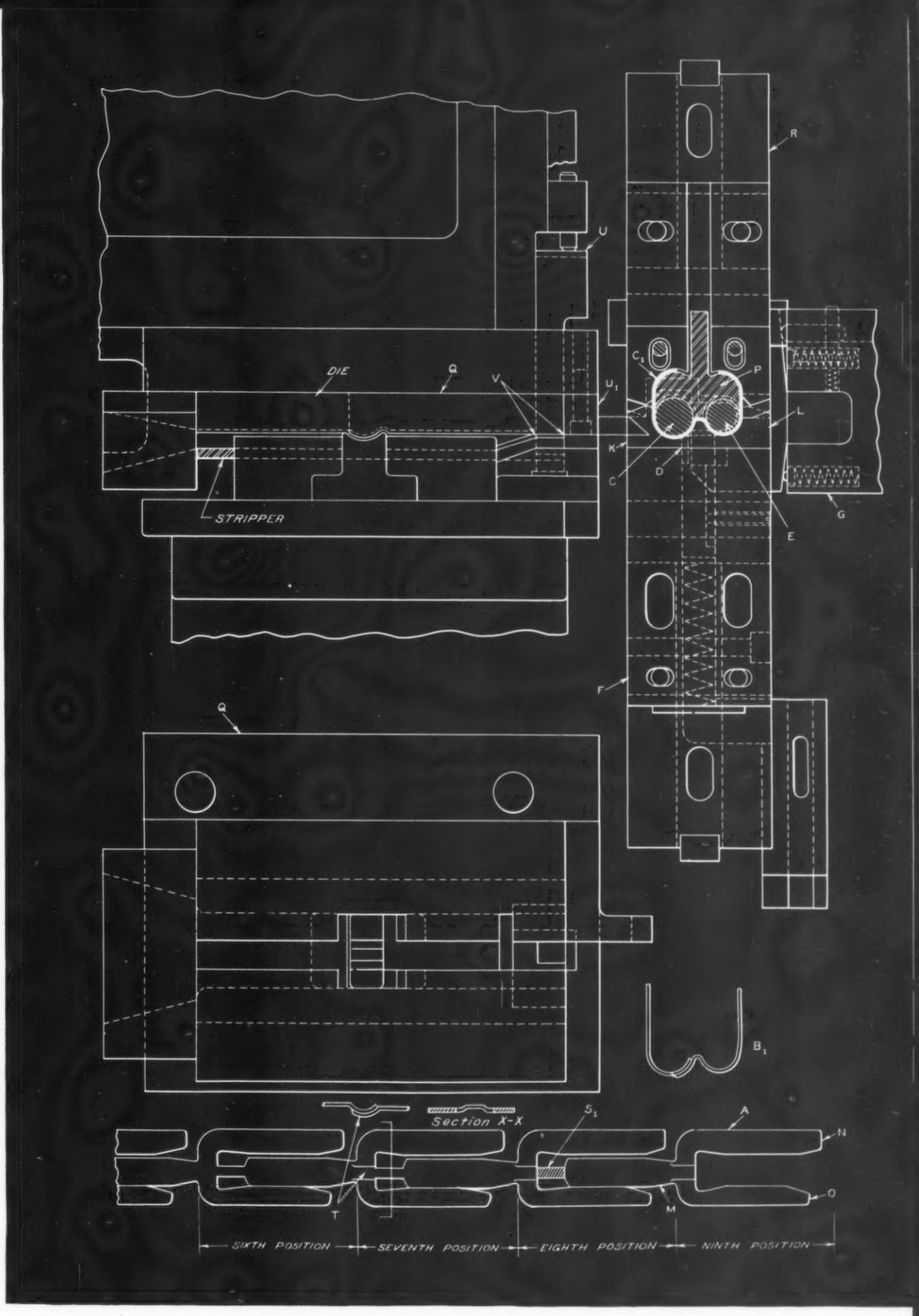


Fig. 10. View of Punch and Die Members Shown in Fig. 7 Assembled to Back-plate of Machine. Plan View of Die Member, Stock Lay-out, Assembled Front and Rear Forming Tools and End Slide G

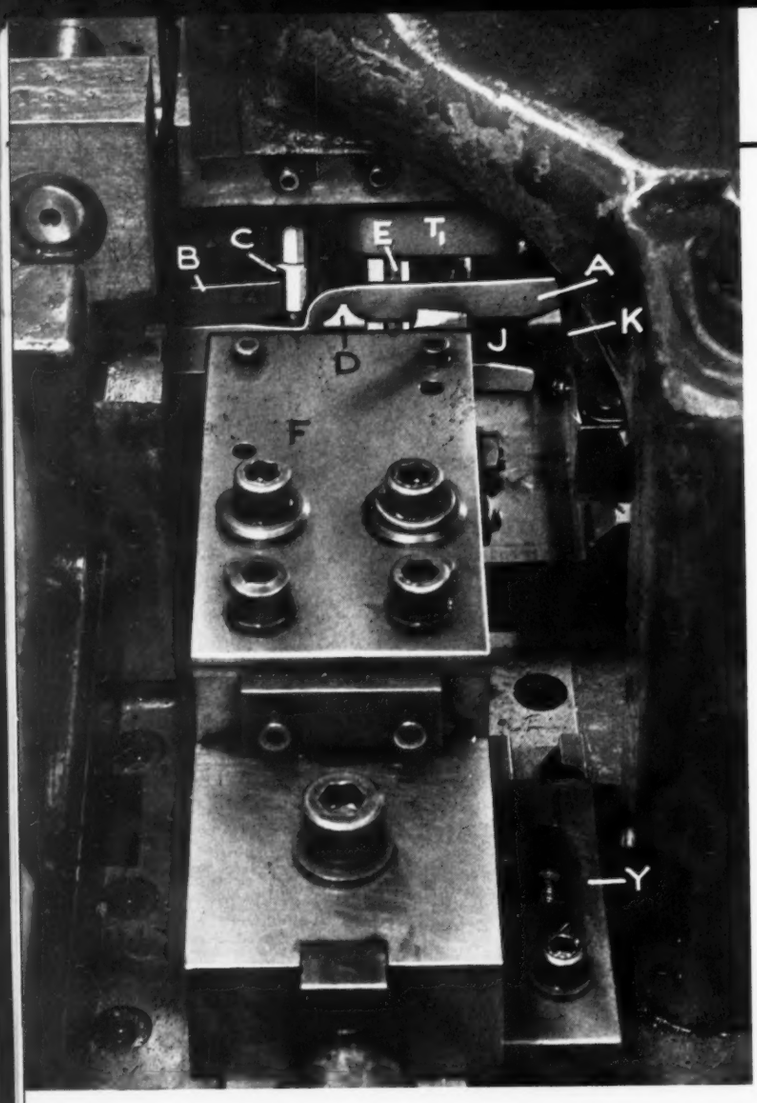


Fig. 11. Close-up View of Front Forming Tool F, Forming Posts C and E, and Stripper T_1 of Two-level Unit that Forms Link Blank A to the Shape Shown by the Enlarged View in Fig. 13

The end slide *G*, Fig. 10, advances to support the work in the lower position, but does no forming. This slide carries a pivoted arm which is forced away from the forming post in the event that the finished link is telescoped by the preformed link being transferred to the lower position. The movement of the pivoted arm, in case of a jammed or telescoped link, serves to actuate a micro-switch, which instantly stops the machine and thus prevents damage to the tools. The stripper T_1, Fig. 11, fits around the front side of forming post *E* and into the space between posts *C* and *E*. It is attached to the lower end of shaft *T*, Fig. 4, the vertical stripping or transfer movement being transmitted through a cam-actuated crank secured to the upper end of shaft *T*.

After the forming tools *R* and *F* have completed the forming operation in the upper level and withdrawn to clear the forming block, posts, and work, stripper T_1, Fig. 11, moves downward, carrying the semi-preformed piece *S*, Fig. 12, with it. This movement continues until the single loop end is opposite the solid radius-forming punch *X* and the spring-backed final forming punch *Y* that complete the radius-forming die for the single loop of the link.

The stationary forming block *P* (Figs. 10 and 13) does not, of course, extend below the upper forming level of tools *R* and *F*. Assuming for the moment that there had been a completely formed link on posts *C* and *E* in the lower level position, the semi-finished link carried downward by the stripper would have stripped the finished link from the forming posts, so that it would have dropped into the chute shown at the rear of the machine in Fig. 3.

After the semi-preformed link (shown at *S*, Fig. 12, and at C_1, Fig. 13) is in place in the

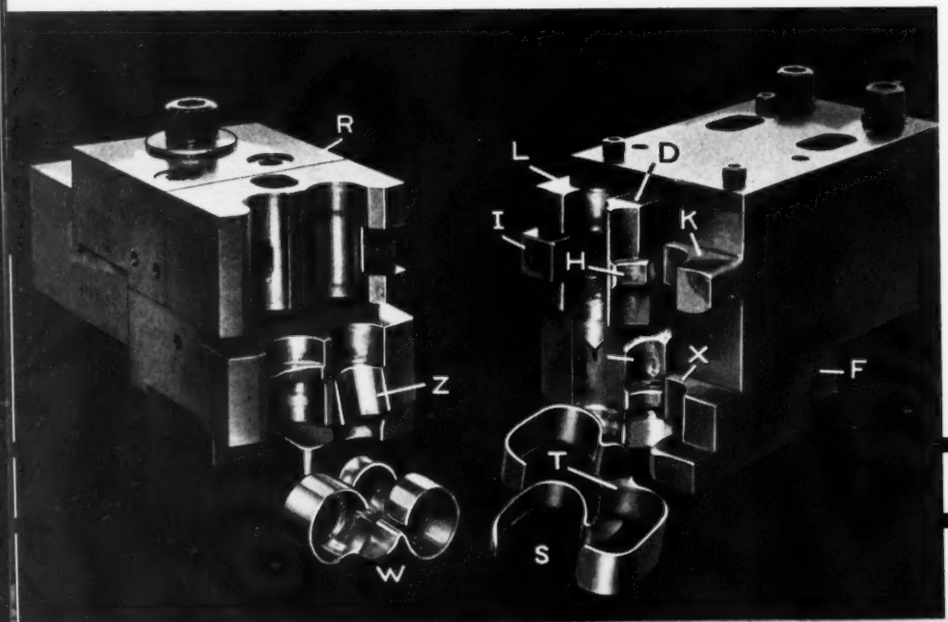


Fig. 12. Two-level Rear and Front Forming Tools that Form the Link Blank to Shape Shown at S in the Upper Level, and Complete the Link as at W in the Lower Level

lower level and the front punch unit *F* has advanced to hold the link against the forming posts, the rear punch unit *R* advances and completes the curling of the link loops around the forming posts.

Referring to Fig. 12, there is a spring-backed locating and stripping punch at *Z* on the rear unit which fits between the two ends of the partly formed loops. This locating punch keeps the two ends of the blank properly spaced while the rear tool unit is performing the final curling of the loops around the lower ends of the forming posts *C* and *E*, Fig. 10, and while the flaring operation is being performed on the small lower loop formed around the flaring tool on post *E*.

An insert or partition in the radius-forming groove to the left of locating punch *Z* serves to keep the large single loop of the link in proper alignment during the final forming operation. The lower edge of the large loop is supported by the projecting ledge which can be seen below the partition mentioned.

Referring to Fig. 12, the position of formed link *W* in the lower level of the tools at the completion of the final forming operation can be visualized more clearly by simply considering link *W* as being tipped upward and then pushed back into the lower level of rear tool *R*. The large loop to the left is thus nested in the forming cavity between the inserted partition in the groove to the left and the projecting ledge at the bottom of the groove. The upper loop of the link to the right will be nested in the forming cavity just above the top of locating punch *Z*, while the smaller loop will be fitted into the cavity below the locating punch.

The forming cavities of units *R* and *F* close in on opposite sides of the link in the lower

Fig. 13. Vertical Cross-section View through Center of Forming Post E, Fig. 11, Looking from Right-hand End of Machine, and Diagrams of Work at Different Stages of Final Forming Operation

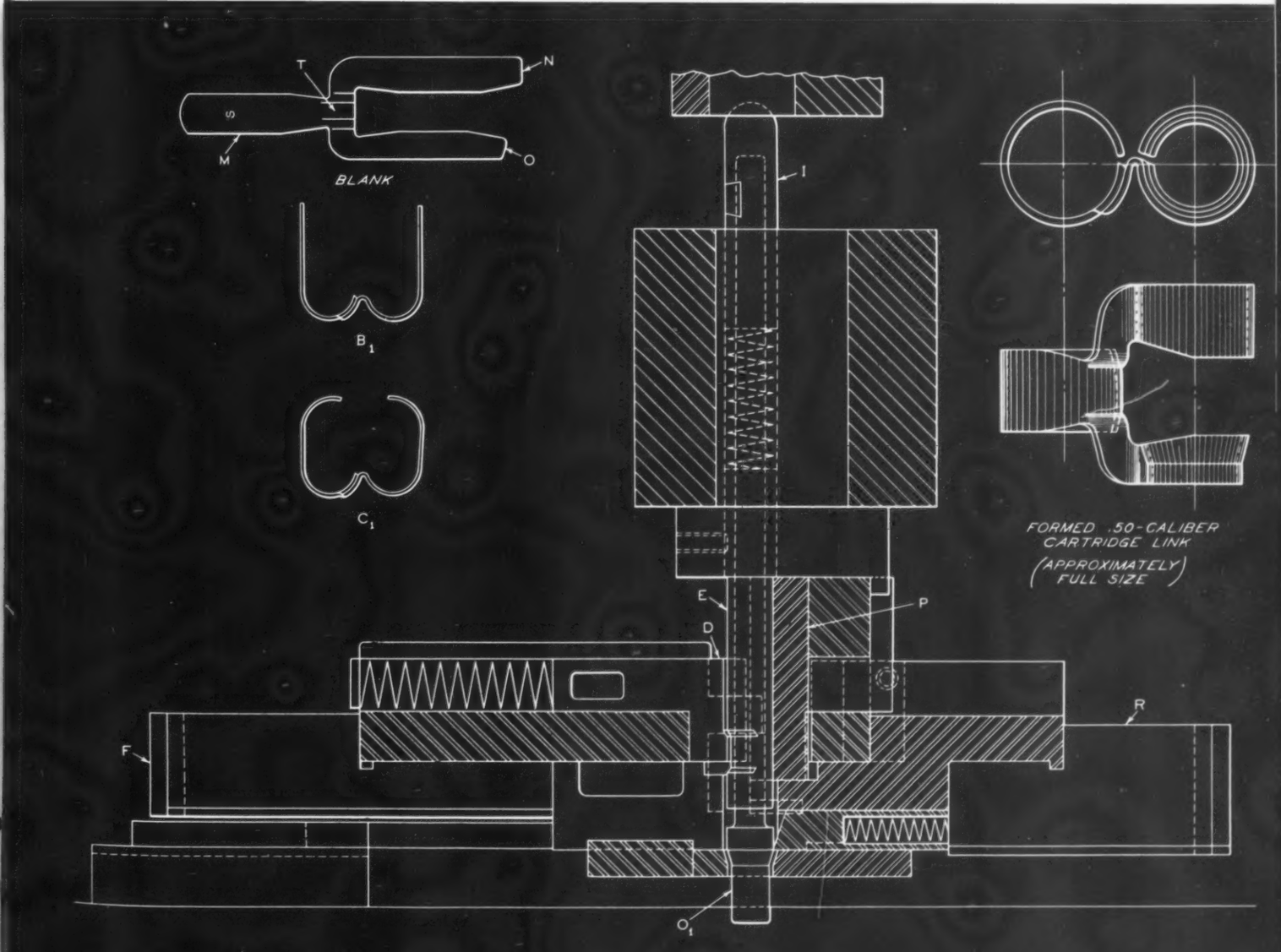


Fig. 14. (Left) The Cartridge Links Enter a Degreaser in the Heat-treating Line from Forming Machines by Way of a Conveyor and also from a Feeding Table, as the Occasion Demands

★

Fig. 15. (Below) Lay-out of Cartridge-link Conveyor-equipped Heat-treating Department Showing Degreasers, Hardening Furnaces, and Auxiliary Equipment

position and form its three loops accurately to size around the forming post. The final forming operation is performed by flaring tool O_1, Fig. 13. This tool forces the upper portion of the smaller of the two loops outward into the conical recess formed by units R and F around the forming tool at a point just below locating punch Z, Fig. 12. The shank of flaring tool O_1, Fig. 13, passes through a hole in forming post E and terminates in a cap I held in place by a dovetail key. The vertical movement required for flaring is imparted to the tool by cam-actuated rocker arm L, Figs. 3 and 4.

When tool F, Fig. 12, moves in for the preforming operation in the upper level, forming tool H forces the previously formed offset T (Figs. 8, 10, and 13) into a mating recess in forming post C, Fig. 11. The raised portion of post C at either side of the recess forms a nest for the offset portion; at the same time, the radius-forming cavity formed by tools L and D, Fig. 12, forces the upper end of the link around forming post E, Fig. 13, at a point above the recess on the other forming post.

The lower end of the link which is to be formed into the smaller flared loop is pressed against the reduced diameter portion of post E. When the link has been thus formed around the

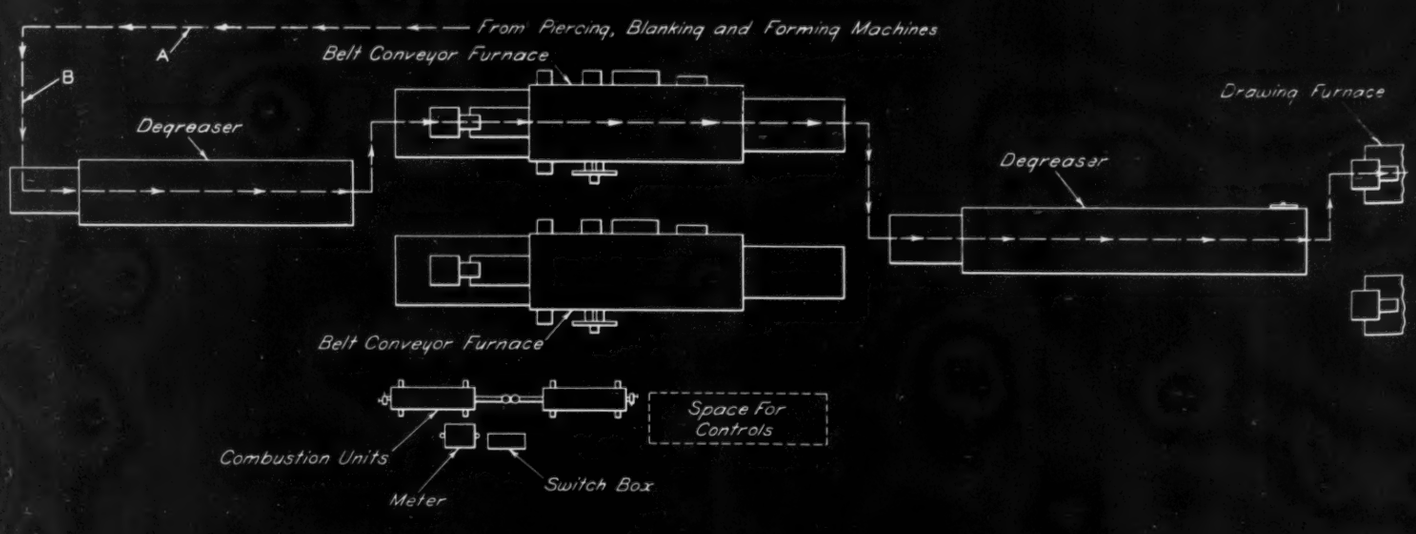


Fig. 16. (Right) After Passing through the Heat-treating, Parkerizing, Oiling, and Baking Units, the Cartridge Links are Disentangled and Dropped on a Conveyor Belt Leading to the Final Inspection Line

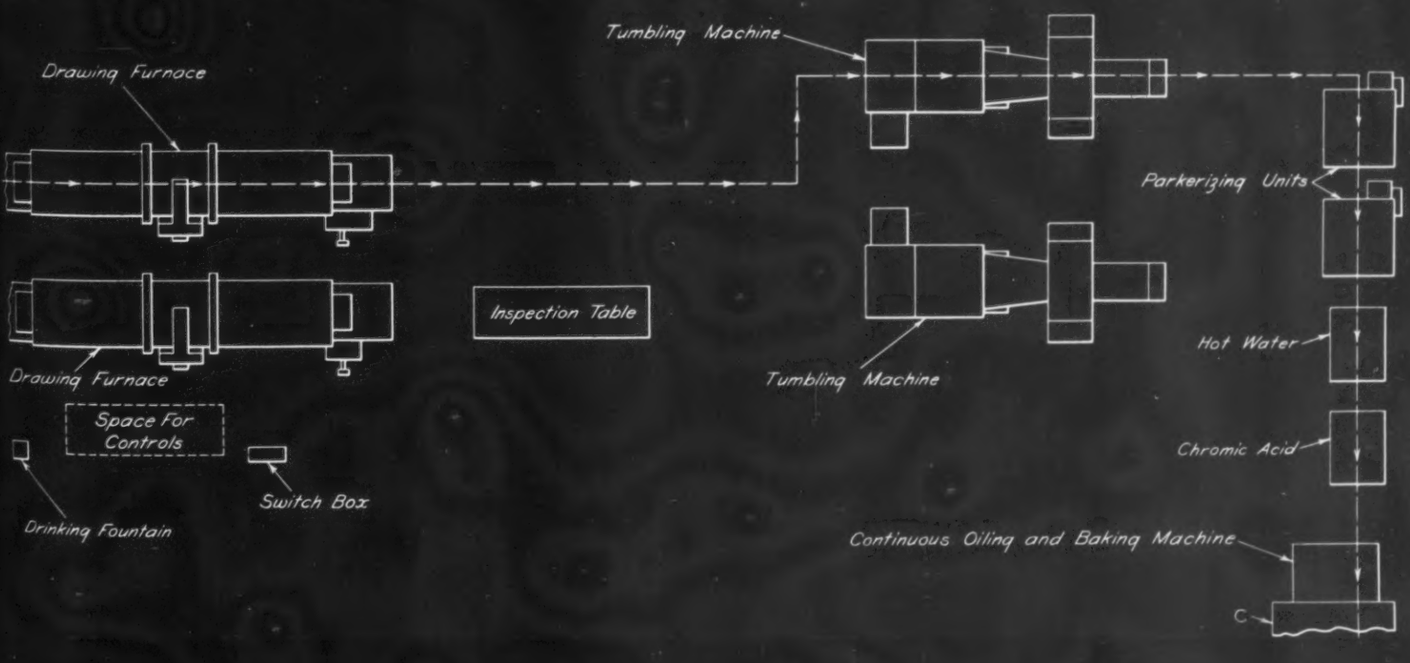
★

Fig. 17. (Below) Continuation of Heat-treating Department Lay-out, Indicating Route of Work through Drawing Furnace, Tumbling Machines, etc.

forming posts, it is held in this position by the front tool while the rear tool advances to form the ends of the link around forming block *P*.

When stripper T_1, Fig. 11, moves downward after the forming tools have withdrawn, the link slides down on the forming posts until the small loop is located on the smaller portion of flaring tool O_1, Fig. 13, which is still in its uppermost position. The larger semi-formed loop above the one to be flared is then located on the extension of forming post *E*, while the single preformed loop is located on post *C*, Fig. 10. The link, now in the lower level, is below forming block *P*. In this position, the three loops are formed accurately to size under the heavy pressure of the front and rear tools.

The forming tools, of course, remain in the closed position while the taper shoulder on tool O_1, Fig. 13, flares the smallest loop on the vertical downward stroke. The upper- and lower-level spring-backed forming tools *H* and *Y*, Fig. 12, serve to hold the links on the forming posts at all times, except when the slides are all the way back. The spring-backed tool *Y* is mounted on a stationary member *Y*, Fig. 11, and fits a slot in the bottom of tool *F*. The final forward movement of tool *F* serves to exert a positive forming pressure on tool *Y*.



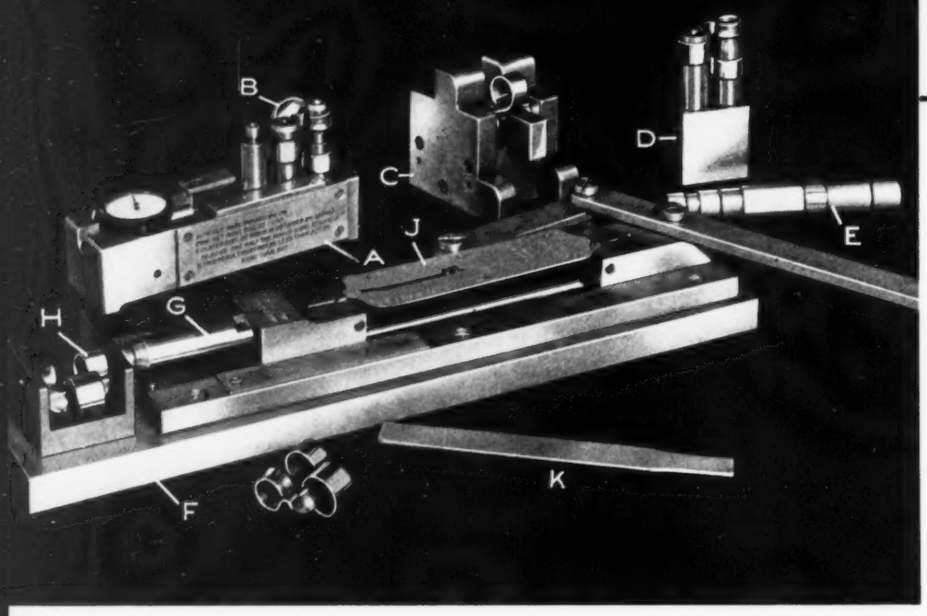


Fig. 18. Close-up View of Gages Used in Checking the Cartridge Links during the Process of Manufacture

★

From the preceding description it will be noted that the tooling of the multi-slide machine for producing the cartridge links consists of six principal units, each of which is made up of individual, accurately fitted tools. Any of these units can be removed without disturbing the others, and can be replaced by a duplicate unit while worn or broken individual tools are being repaired or replaced; thus, the machine can be kept in practically continuous operation. In some cases, the individual tools are of built-up construction, designed either to facilitate machining or replacement of the parts most likely to become worn.

When the complexity of the problem involved in producing the cartridge links is fully appreciated, through careful consideration of the form of the link and the requirements it must meet, the accuracy and high production rate obtained by the comparatively simple tools appear little short of miraculous.

To the machine gunner engaged in aerial combat, the proper functioning of the cartridge link is a life-and-death matter; consequently, no effort is spared during the manufacturing, and in the final inspection, to insure the production of links that will function properly under all conditions. The gages shown in Fig. 18 are employed to inspect sample links in the process of manufacture and in setting up or adjusting machines and equipment.

One of the dimensions required to be held within plus or minus 0.010 inch is the center distance between loops, as indicated by the minimum and maximum dimensions 0.927 and 0.947 shown in the detailed view, Fig. 1. The gage shown at *A*, Fig. 18, is employed for checking this dimension. The link to be tested is placed over the two posts at the right, as shown, after which ball-handle lever *B* is swung over to the position indicated. The exact distance between the loop centers can then be obtained by noting the indicator reading and making a simple calculation.

At *C* is shown a width-testing gage for checking the links before hardening. The central member of this gage checks the space between the two loops, while the slots check the over-all width and the widths of the loops simultaneously to insure correct relationship between the loop positions, as required for proper functioning in the gun after the links have been hardened and tempered. The gage shown at *D* is also used to test the center distance and size of the loops. "Go" and "No Go" plug gages like the one shown at *E* are used to check the inside diameters of the loops before and after hardening.

The gage shown at *F* tests the pull, in pounds, required to extract a cartridge from the link. A mandrel or plug gage *G*, which is the exact shape and size of a 0.50-caliber cartridge case, is pushed through the loops of the link *H* to be tested by pulling forward the handle at the right-hand end of the gage. When the handle is moved in the opposite direction, the force required to withdraw mandrel *G* is indicated by spring scale *J*. For the 0.50-caliber cartridge, the pull required for extraction should be from 10 to 25 pounds. Numerous simple flat metal gages, such as that shown at *K*, are also employed in setting the tools used in producing the links, as well as in testing the work.

Upon the completion of the operations in the multi-slide machines, the cartridge links are deposited directly on the traveling belt *A* of the conveyor-equipped production line shown in

Figs. 15 and 17. The inclined conveyor at *B*, which carries the links from belt *A* to the Blakeslee degreaser, is shown in Fig. 14. As may be seen in this illustration, provision is made for the supplementary feeding of links directly to the degreaser from a table while the conveyor system is in operation. There is also a conveyor leading to the divided belt of the degreaser from the other side, which is used for an entirely different product.

From the degreaser, a vibrator feeder deposits the cleaned links on a conveyor leading to the General Electric hardening furnace and quenching unit, from which the hardened links, now in a brittle condition, are carried to another Blakeslee degreaser. From this degreaser another vibrator feeder deposits the links on a conveyor which carries them through the Gehnrich drawing or tempering furnace.

From the tempering furnace, the links pass to an "Ideal" tumbling machine, Fig. 17, made by N. Ransohoff, Inc. For the tumbling operation, the links are mixed with sand. From the tumbling machine the links are lowered into perforated cylinders which are carried by an overhead crane to the first unit of the Parkerizing system. Referring to Figs. 15 and 17, it will be noted that, except for the degreasers, which have a divided belt, there is a second line of hardening and tempering furnaces, sand cleaning and Parkerizing equipment, which is used part time to provide the necessary capacity for the links. When not in operation on links, this line is used for an entirely different product.

The links are conveyed from the chromic-acid tank to the oiling and baking unit, the front section of which is shown at *C* in Fig. 17.

The oiled and baked links, which are being temporarily fed by hand (Fig. 16), will be fed by vibrator feeder from the hopper to the belt leading to the final inspection and packing line, shown in Fig. 20. Conveyor belt *A*, Fig. 16, carries the links to the far end of the inspecting and packing line, the belt passing beneath the inclined table. At the far end of the line, the links are transferred to a belt *B*, Fig. 19, which travels continuously in front of the upper row of girls who perform the final inspection operations on gaging equipment like that shown in Fig. 19. Any links that are not picked up from belt *B* and inspected are returned by chute *C*, Fig. 16, to belt *A* which transfers them again to belt *B*, Fig. 19.

The final inspection consists of placing a link on the two posts *D* and *E* of the gage, as shown in Fig. 19, and pushing it back until a lever *F* is operated. This results in an electrical connection that actuates a relay, which, in turn, controls an air valve. The air valve admits air to cylinder *G*, causing the piston to move the slide carrying post *D* to the left until a pull of 100 pounds is exerted on the link. If the 100-pound pull causes the loops to be separated beyond a certain predetermined center-to-center distance, the red light at *H* will flash a signal. After the 100-pound pull has been applied, post *D* returns automatically to its normal position, and the operator withdraws the link until the single loop is clear of post *D*. The link is then turned a half-revolution in a clockwise direction and pushed back on post *E*; it is now swung back in an anti-clockwise direction. If the large loop of the link passes freely under gage *J*, the link is satisfactory, so far as the pull test is

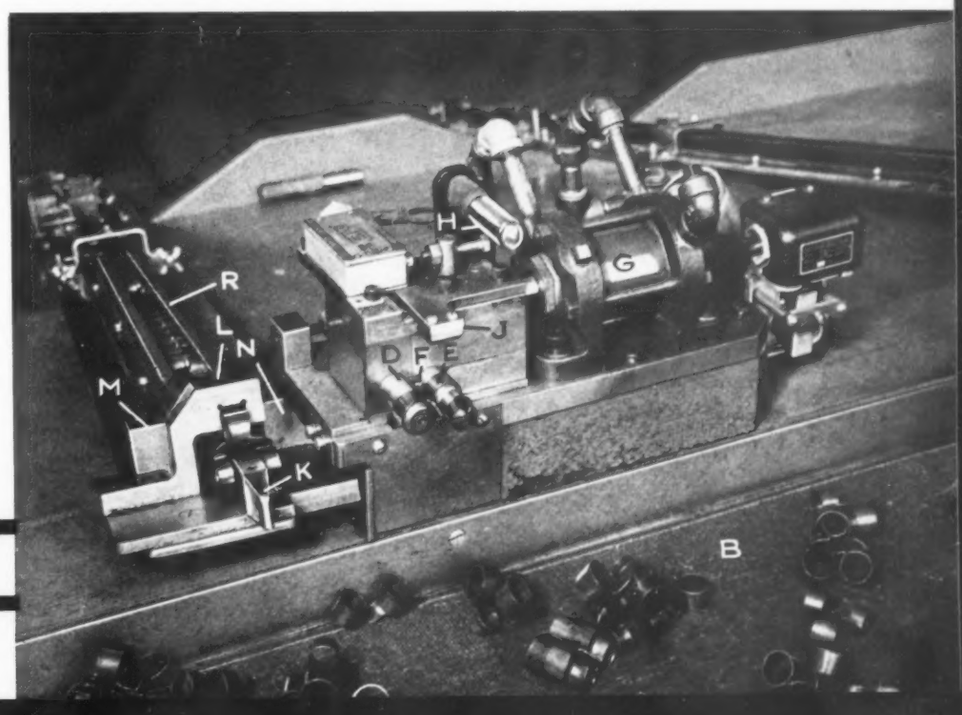


Fig. 19. Final Inspection Gages which Each Cartridge Link Must Successfully Pass before Sliding Down Chute R to be Packed in Cardboard Cartons

concerned; but if it will not pass under this gage, it is rejected.

If the loops are not separated sufficiently by the 100-pound test pull to cause the light to flash, and the link is not broken by this pull, the temper or springiness is satisfactory. The temper is also satisfactory if the loop springs back after the test, so that the center-to-center distance between the loops will permit the large single loop to pass under gage *J*, as described. Links with loops that will not slide over posts *D* and *E* are rejected, since these posts are made to the minimum link diameter sizes.

After a link has passed the pull test, the space between the two loops is checked by passing the link over the gaging tongue *K* as indicated. If the link passes over gage *K*, it is pushed along to check the width of the single loop by means of the upper gaging block *L*. If the large single loop successfully passes through gage *L*, the link must still pass between blocks *M* and *N*, which gage the over-all width of the double loops. When a link has passed these tests, it slides down loading chute *R*.

Chutes *R*, also shown in Fig. 20, lead to the carton-packing stations operated by the girls in the lower row. One girl at the loading station attends to the packing of the links inspected by two girls in the upper row. The packing consists of placing one of the cartons in the filling position at the end of chute *R*, as indicated at *S*. The slotted side of the carton, which permits the links to be viewed without opening the carton, is placed uppermost. The carton is located in the filling position with the upper end open. A gate, which cuts off just ten of the links, holds back the following line of links in chute *R* while another gate near the open end of the carton is raised. This allows ten links to slide into the carton, which is then removed, closed at the end, and placed on a conveyor belt which carries the cartons to the shipping department.

Fig. 20. Final Inspection and Packing Department. Links Inspected with Equipment like that Shown in Fig. 19 by Girls in Upper Row Pass down **PAGE 138** *Chutes R to Girls in Lower Row, where They are Packed in Cardboard Boxes*

Rolled and Cast Kirksite in Airplane Plants

By WILLIAM W. BROUGHTON
Engineering Representative, National Lead Co.

A New High-Strength Zinc-Base Alloy in Rolled and Castable Forms has Solved the Problem of Supplying Large Numbers of Forming and Blanking Dies for Airplane Parts

Approved for Publication by the War Department

THE tremendous acceleration in the tempo of aircraft production since the first orders were received from Britain in the early days of the war has brought about radical changes in materials and methods of manufacture in almost every department of airplane construction. Many of these changes have been described in the technical press. One of the most perplexing problems to be solved, and one which has received relatively little publicity, was that of obtaining a suitable material for sheet-metal forming dies, and of determining the most effective way in which dies of this material could be used.

Before the war, when an order for ten planes was an infrequent windfall, and when interchangeability of parts was relatively unimportant, many sheet-metal parts were made by hand over wooden forms. Other parts were formed on rope drop-hammers between sand-cast dies of unalloyed low-purity zinc and chill-cast punches of antimonial lead. The tensile strength of the unalloyed zinc was about 6000 pounds per square inch when new, and much lower after a few remeltings. The blows of the hammer used in forming the parts set up stresses in the die beyond the elastic limit of the zinc, and a permanent set resulted. Each succeeding part was slightly larger than its predecessor and only a few parts could be produced before the die cracked. The use of zinc dies for heavy-gage aluminum alloys, stainless steel, and Inconel was impracticable.

The situation became acute in the spring of 1938, when one of the most important factors in holding back the delivery of aircraft was the slow rate at which the stampings could be made. The development of an alloy that would result

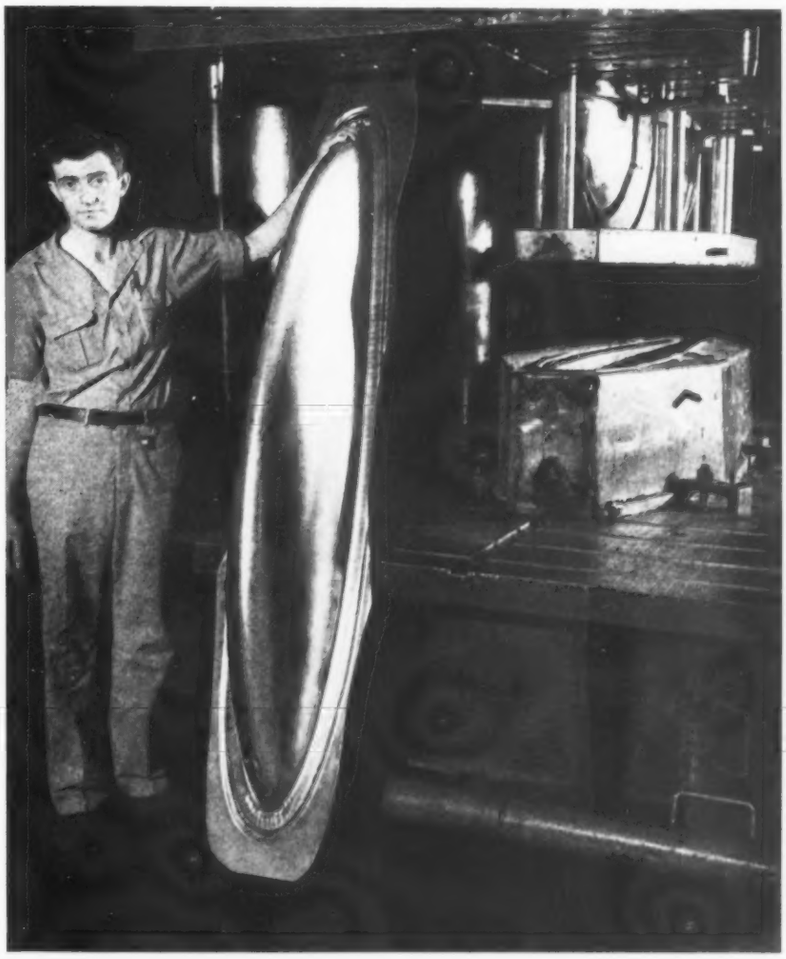


Fig. 1. The Deep-drawn Tip-skin Shown Exemplifies a Difficult Forming Operation Accomplished with a Kirksite Die. The Work is About 13 Inches Deep and 6 Feet Long

Table 1. Physical Properties of Kirksite "A," Compared with Cast Iron and Sand-Cast Aluminum Alloys

	Ultimate Tensile Strength, Pounds per Sq. In.	Charpy Impact Strength, Foot-Pounds to Break ¼-Inch Bar	Brinell Hardness Number	Solidification Shrinkage, Inches per Foot
Kirksite "A"				
Sand-cast	37,800	4	100	0.14
Rolled	62,000	—	100	—
Cast Iron	18,000 to 50,000	less than 1	132 to 270	0.125 to 0.188
Sand-cast Aluminum Alloys	19,000 to 29,000	0.6 to 4.0	40 to 70	0.156

in sturdier dies, and yet could be easily formed to accurate shape became the major activity of Morris P. Kirk & Son, Inc., a Los Angeles affiliate of the National Lead Co., who had been supplying most of the zinc used by the West Coast aircraft builders.

Finally Kirksite "A," a zinc-base alloy having a tensile strength of 37,800 pounds per square inch, was developed, and the situation was immediately relieved. The physical properties of this alloy, which approach those of mild steel, enabled the aircraft producers to step up their output of stamped parts, and to achieve the accuracy necessary in making parts of the desired interchangeability. The properties of this alloy are given in Tables 1 and 2.

During the period of early application of Kirksite for dies and punches, drop-hammers were used extensively for forming the many aircraft sheet-metal sections. One difficulty of this method, however, was the fact that wrinkles continually appeared during the forming operation. These wrinkles had to be flattened out, for if they became so deep as to form folds, no amount of hammering could remove them.

On deep draws, it was necessary, therefore, to restrain the stroke of the hammer by means of wooden shims, and to do some hand hammering between blows of the drop-hammer, thus working the sheet metal into final shape progressively. The wooden shims were removed, one by one, until the final shaping was done with a full blow of the drop-hammer. It soon became evident that if further progress in increasing production of these parts was to be made, some way of restraining the material from wrinkling had to be found, so that the necessity for hand work and for limiting the stroke of the punch could be eliminated.

Table 2. Additional Physical Characteristics of Sand-Cast Kirksite "A"

Compressive Strength	60,000 to 75,000 pounds per square inch
Melting Point	717 degrees F.
Weight per Cubic Inch	0.25 pound
Weight per Cubic Foot	432 pounds
Elongation in 2 Inches*	3 per cent
Coefficient of Linear Expansion	0.0000154 per degree F.

*Kirksite "A" in rolled form has an elongation of 30 per cent in 2 inches.

Fig. 2. Two Large Blanking Dies of Rolled Kirksite Employed for Blanking 5/32-inch Dural Wing-skin

This restraint was finally provided by using a mechanical press equipped with what are called "blank-holders," "pressure pads," or "pinch rings." These holders, which may take the form of a gripping ring for round pieces or side clamping rails for straight pieces, hold the sheet metal firmly in place, so that it is actually shrunk at those points where wrinkles would otherwise occur.

Such an arrangement, it was found, permitted much deeper draws than had formerly been possible. A secondary press action is, of course, necessary to provide this restraint. Double-acting presses provide a positive method of holding the blank, but much the same result can be achieved on a single-acting press or a hydropress by means of spring-loaded pins or pins cushioned by compressed air.

The adoption of the press method of forming speeded up the operation of making deep-drawn parts tremendously, and the job of transferring drop-hammers to other work while the presses take care of these operations is still going forward. Kirksite has proved applicable for both the dies and punches used in these presses.

A number of changes in technique have taken place in adapting drop-hammer dies for use in these presses: (1) For deep draws, the surfaces over which the metal is drawn will wear a great deal longer if given an initial high polish, using a canvas buffing wheel and a greaseless compound or rouge. A mirror finish is desirable. (2) The blank-holder should be accurately fitted to the die by "spotting in" with Prussian blue and a flexible-shaft grinder. (3) The edges over which the metal is drawn should have as small radii as possible. The actual radius in each case depends upon depth of draw, and type and temper of the sheet metal. (4) The blank-holder should grip the sheet metal as close as possible to the edge over which it is drawn.

One example of a deep-drawn part that presented an unusually difficult forming problem is shown in Fig. 1. This is a stabilizer tip-skin made by the Lockheed Aircraft Corporation on a double-acting press. Three drawing operations were required. The first two were each followed by an annealing operation, and the last by a heat-treating operation. The final contour was obtained by a stretching operation, also accomplished on a double-acting press. It will be noted that the die, which is made of Kirksite, has a bead around the face, which serves to stiffen the flange against buckling, thus obviating excessive hold-down pressure.

Rolled Kirksite Used in Place of Steel Blanking Dies

The cutting of blanks has long been a costly and time-consuming operation in aircraft work. It is usually done by routing methods. A stack of twelve or more sheets of aluminum alloy and a guide templet made of metal or of Masonite are bolted together and placed on the table of a routing machine having a swinging arm arranged to reach any part of the table. After the stack has been routed, it is necessary to remove the bolts and assemble another stack. The templets wear rapidly and the router cutters become dull after a few operations. Besides, the cutters are both hard to get and expensive. The amount of spoilage is often appreciable because of the dependence of the process on the skill of the operator. It is also usually necessary to perform a burring operation on the finished blank.

The cost of steel blanking dies is high, and, what is more important, skilled diemakers are not available. The time consumed in making steel blanking dies is also prohibitive, owing to the number of blanks required. The adoption

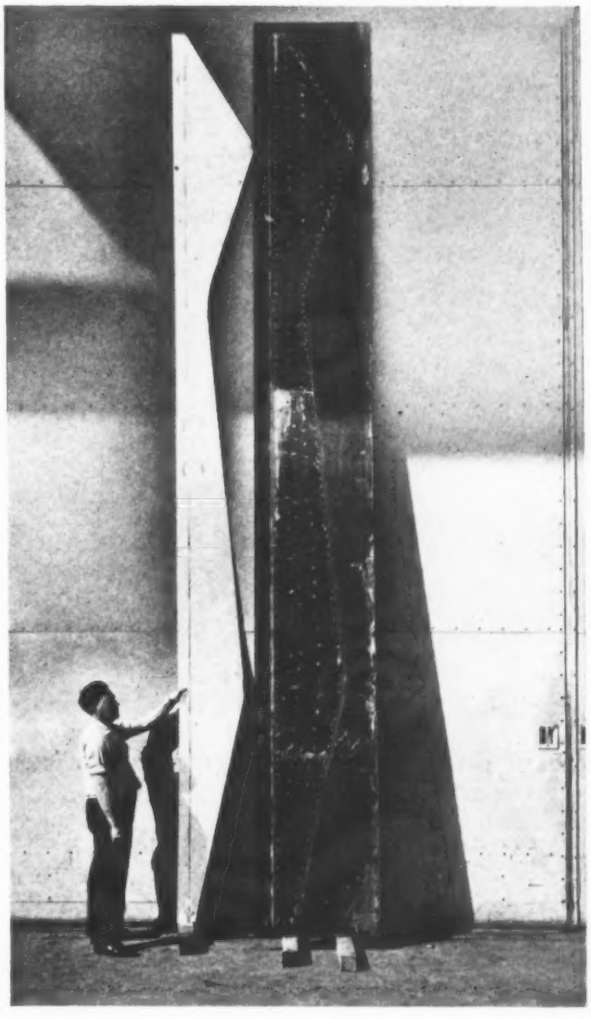


Fig. 3. The Finished Wing-skin Blank is 232 Inches Long. The Punch, Shown beside the Blank, is in One Piece, and is Shifted when the "Second-operation" Section of the Die is Installed in the Press

Fig. 4. Punch-press Set-up for Blanking Alclad in Heavy Gages. Both Punch and Die are Sand-cast Kirksite "A." The Rubber Blanket Attached to the Punch Strips off the Scrap

of rolled Kirksite for blanking dies has obviated the difficulties mentioned and made the production of blanks a much faster and more efficient operation.

The development of a method of making blanking dies of rolled Kirksite "A" by the Consolidated Aircraft Corporation has been fully described elsewhere. Since the beginning of this development, progress has been continuous, and dies of this kind are now being used by nearly all aircraft producers.

One of the most spectacular die sets made with rolled Kirksite "A" is shown in Fig. 2. It is used by Consolidated to produce a wing-skin part of 5/32-inch ST Dural. This part, which is 232 inches long, is shown in Fig. 3.

In operation, part of the punch is fastened to the lower platen of the press with outboard support under the overhanging end. The "first-operation" section of the die (provided with a shear angle for a distance of about 10 inches from the open end) is fastened to the upper platen and a number of parts are partially blanked.

The punch is then shifted, the "second-operation" section of the die installed in the upper platen, and the blanking of the parts completed. Overlaps of the two "operation" sections prevent

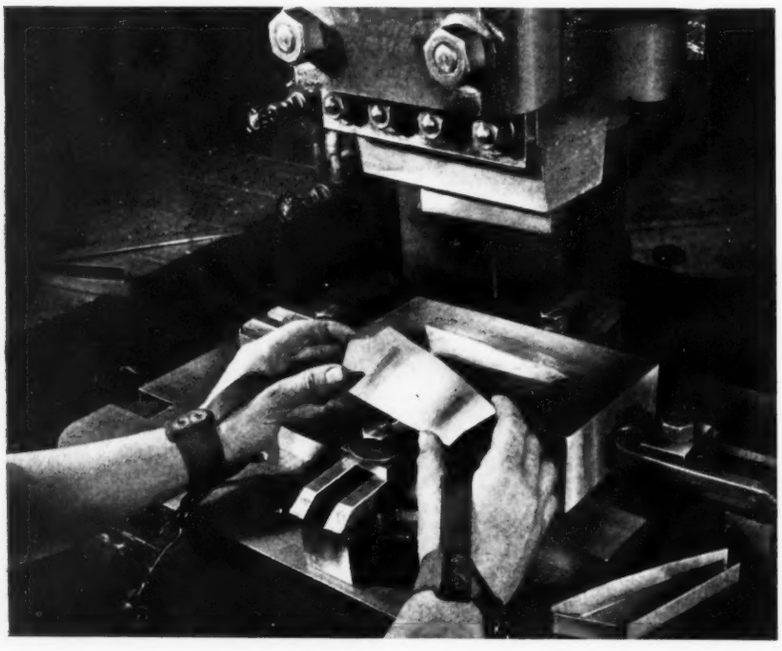
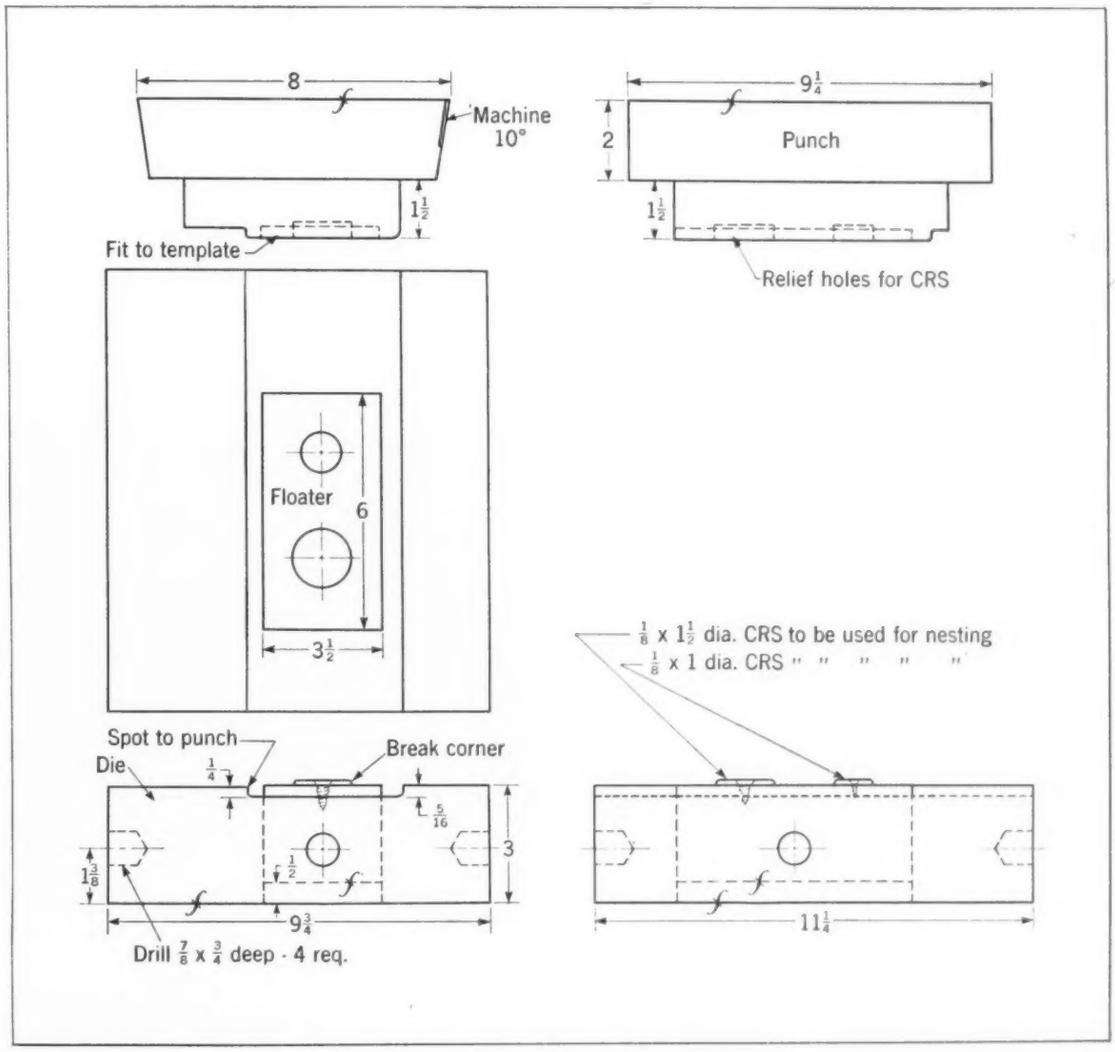


Fig. 5. A Punch-press Die Set up to Form Preblanked Sheet Metal. No Machining was Necessary on the Faces of Punch and Die, Except for Placing of Positioning Pins

Fig. 6. (Right) Another Kirksite Die Employed for Forming Preblanked Sheet Metal, of Similar Design to that Shown in Fig. 5

Fig. 7. (Below) Detailed Design of a Punch-press Forming Die Set of Kirksite for Forming a Preblanked Part and Shaping it to Facilitate Stacking



tears or cracks in the blank. The die is made of 1/4-inch Kirksite, and 210 blanks have been produced without harming its shearing edge.

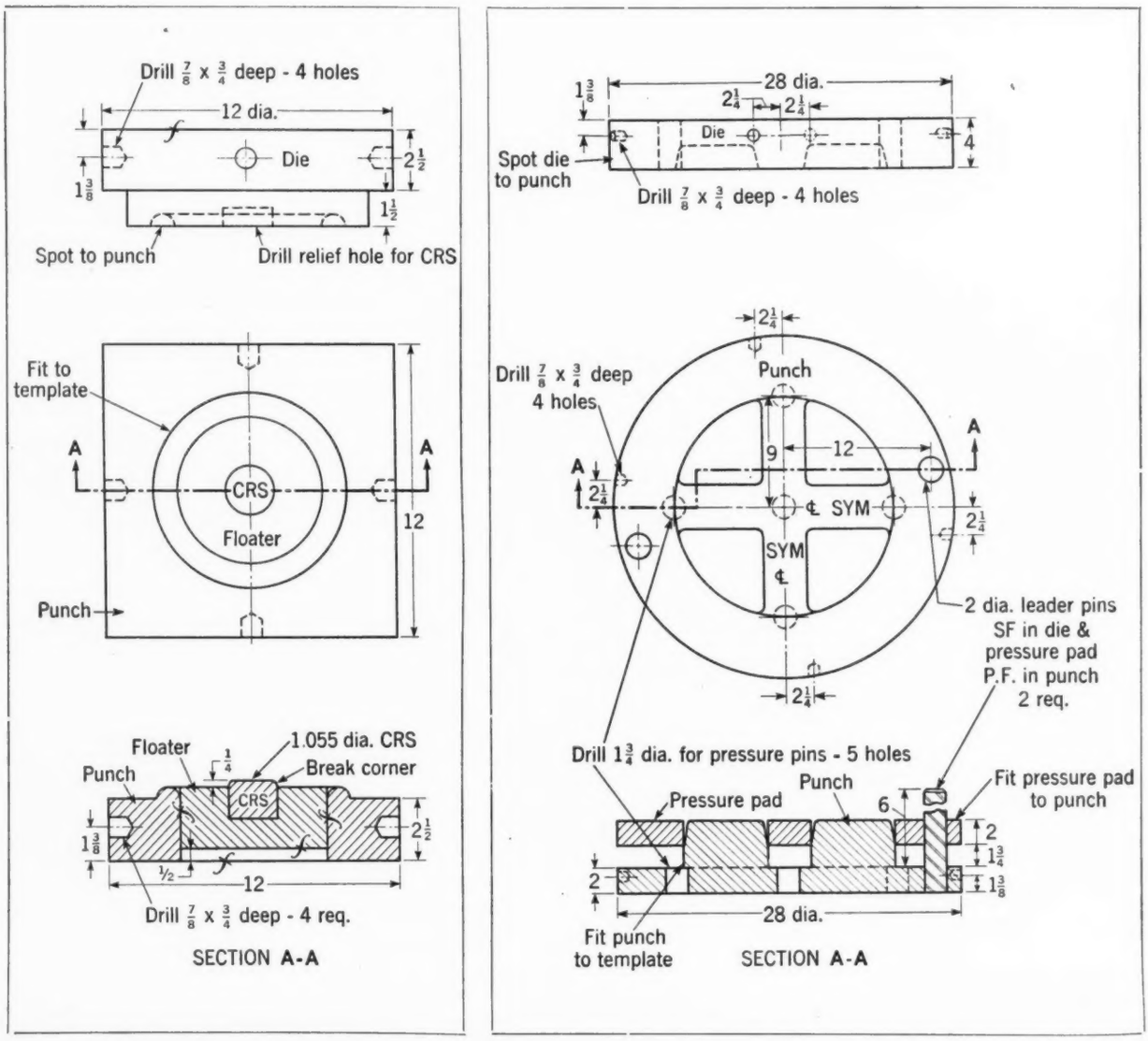
Mass Production of Pierce-Blank Templet Dies

Another outstanding use of rolled Kirksite is found in the Douglas Aircraft Co.'s plants in the production of so-called "pierce-blank" dies. The huge number of parts needed for the many models of aircraft being produced by this company made it possible to assemble these dies on a straight-line production basis. So far as the writer is aware, this is the first application of mass production methods to tools that are not to be sold, but are to be used in another assembly line.

These dies produce a finished blank, complete with rivet holes, lightening holes, and profile, ready to be applied to the airplane or to go to the forming press if it is to receive a shape of double curvature.

Consolidated Aircraft has produced many thousands and Douglas Aircraft is producing hundreds per month of these dies with a maximum labor requirement of 60 man-hours per die and an average of 1 to 2 man-hours. Some of these dies cut as many as 1000 rivet holes in a single blank. They are serviceable for the production of many thousands of blanks, and have the advantage of being self-sharpening. This

Fig. 8. (Left) Another Kirksite Die for Forming Heavy Aluminum-alloy Stock. The Floater Acts as a Blank-holder to Restrain Wrinkling when Outside Roll is Formed, and also Ejects the Stamping. Fig. 9. (Right) A Kirksite Punch-press Die with a True Pressure Pad. Change-over from Former Drop-hammer Die Resulted in Increased Output, Improved Appearance, and Less Scrap



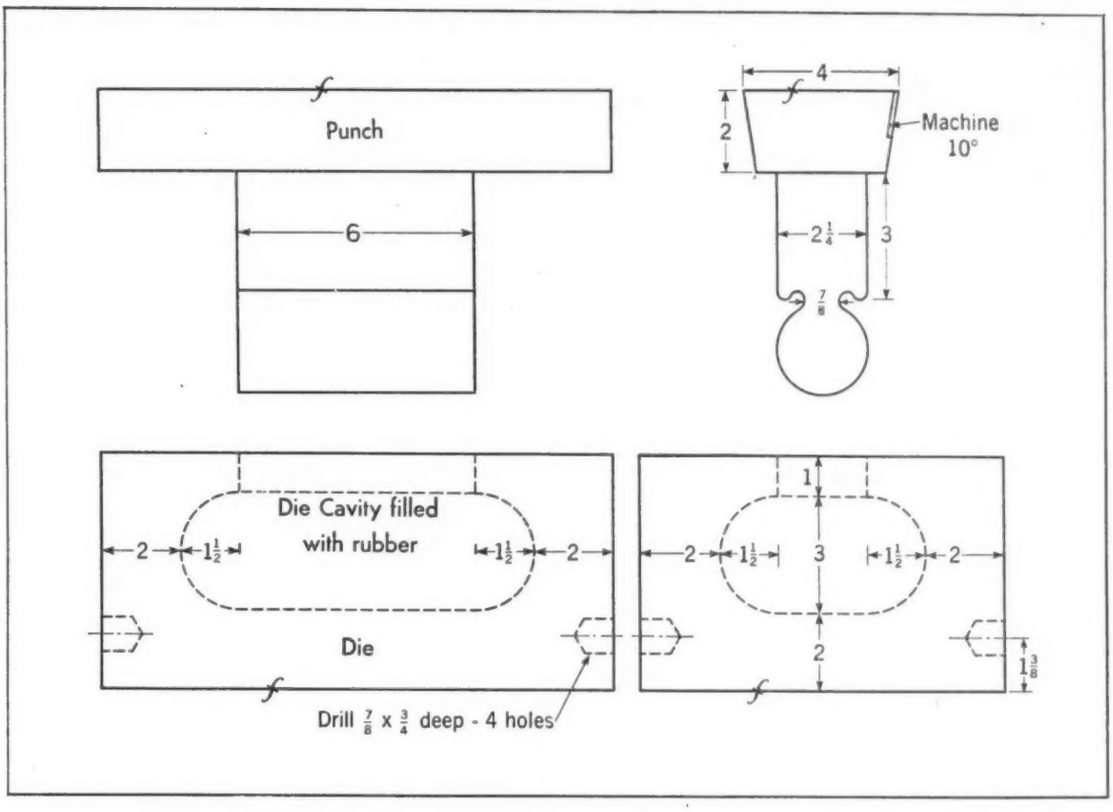


Fig. 10. The Cavity in This Kirksite Die is Filled with Rubber. The Blank is Made to Conform to the Shape of the Punch by the Hydrostatic Pressure Developed in Displacing the Rubber

self-sharpening action results from having "zero" clearance between punch and die, and having the die made of a ductile alloy. A slight flow of Kirksite "A" takes place toward the steel punch at every stroke of the press, causing a light honing action, which results in perfectly sheared blanks with smooth, square edges.

Duralumin blanks (24S-T) up to 1/4 inch thick are being produced in large quantities, and even corrosion-resistant steel sheets 0.026 inch or less in thickness are successfully blanked in quantities of 100 or 200.

These "pierce-blank" templet dies are used on punch presses, hydro-presses, and in one plant, at least, on an air drop-hammer. They are easy to handle, require little storage space, and have a high salvage value. The latter is true because Kirksite "A" can be used in the die foundry, and the standard backing plates on which punch and die are mounted, as well as the standard steel piercing punches, can be used again on new die sets.

Another recent development is the substitution of rolled Kirksite "A" in thicknesses of 1 inch and more for pressed wood, and sand- or chilled-cast duralumin scrap. In the former case, the change is due to lack of durability, and, in the latter, to the shortage of aluminum, which makes it necessary to return all scrap alloy to the sheet-metal supplier. It is now possible to obtain rolled Kirksite "A" in sizes up to 3 feet by 8 feet by 1 inch.

The use of heavy-gage (1 to 3 inches thick) rolled Kirksite dies in one of two 2500-ton Bliss hydraulic presses in a Douglas Aircraft plant was shown on page 168 of July MACHINERY (Fig. 1). The dies are placed on six electrically operated tables which are moved in sequence underneath the press ram for forming and stamping the sheet-metal parts.

Then, there are small odd-shaped stampings required in large numbers for modern airplane construction, which are slow to produce on the drop-hammer. These are now being made much more rapidly on punch presses. Frequently, "blank and form" or "form and trim" dies perform in one stroke of the press what used to be done in two or more slow operations.

Here again, Kirksite, being castable and having sufficiently good physical properties, is an excellent material from which a large variety of dies and punches can be produced. The use of antimonial lead punches on the mechanical presses has not proved practical, because of the difficulty in attaching such punches to the upper platen and the necessity for frequent stroke ad-

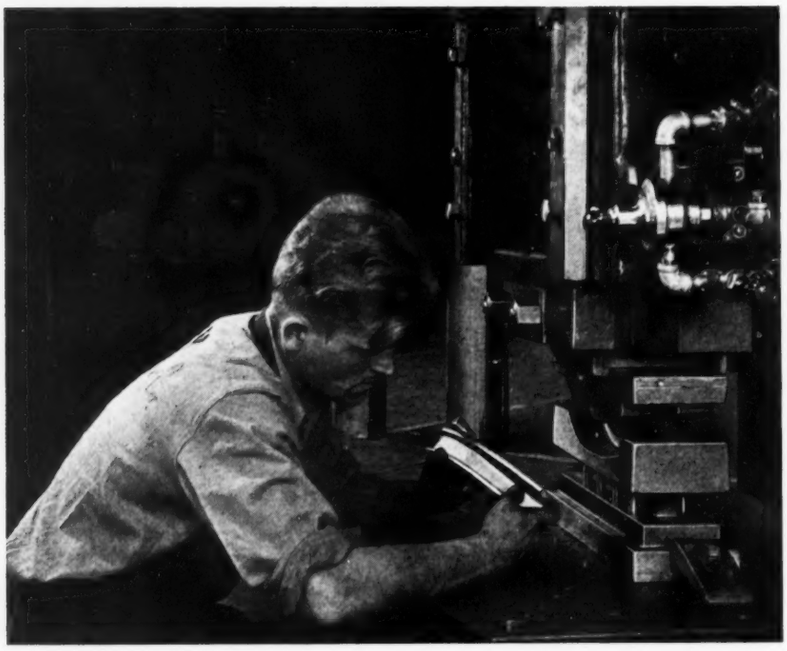


Fig. 11. A Three-part Forming Die Made of Sand-cast Kirksite "A." A Die of This Kind can be Completed — from Blueprint to Press — in Twenty-four Hours

justments to compensate for wear and plastic deformation of the soft punch. This difficulty has been overcome by using Kirksite for both die members.

Use of Sand-Cast Kirksite Dies for Blanking

Some of the Kirksite dies used by the Vega Airplane Co. will now be described. In Fig. 4 is shown a punch press set-up for blanking Alclad in heavy gages. The punch and die are sand-cast Kirksite "A." No machining, other than planing the top and bottom surfaces of both punch and die and the drilling of clamping holes, was necessary.

Two punch-press dies set up to form preblanked sheet metal are illustrated in Figs. 5 and 6. No machining was necessary on the faces of the punch and die, except for the placing of the positioning pins.

The die seen in Fig. 8 is used to form heavy aluminum-alloy stock. The floater acts as a blank-holder to restrain wrinkling when the outside roll is formed, as well as to eject the stamping.

A punch-press die with a true pressure pad is shown in Fig. 9. This die superseded a drop-hammer die, and not only produced many times the number of parts per hour, but resulted in improved appearance and less scrap.

The punch-press die shown in Fig. 10 has a cavity which is filled with rubber. The hydrostatic pressure developed in displacing the rubber causes the blank to conform to the shape of the punch. The finished part is slid off the end of the punch.

A three-part forming die made entirely of sand-cast Kirksite "A" is shown in Fig. 11. No machining was done on the surfaces that actually form the part. The only machining needed was simple planing and drilling. The blank-holder is actuated by spring-loaded pins.

All the parts shown in Fig. 12 were blanked and formed on Kirksite dies in punch presses. This collection includes parts made of 0.023-inch Inconel and 0.125-inch Alclad.

Kirksite "A" is being used in dies for mechanical presses because it offers a number of advantages. It can be cast in sand so accurately that most of the machining that would be necessary on steel dies is eliminated. It is sufficiently hard and tough to stand up under the long runs on heavy sheet metal that are common in aircraft work. It is not so hard, however, that it will scratch the sheet metal, even when Alclad is used. It can be repaired by a simple welding method to correct for wear and to make minor engineering changes. It can be remelted and recast many times without sacrifice in physical properties or in oxidation losses, thus providing at least a 95 per cent metal salvage value.

Some dies for stretching presses are also being made of Kirksite, although most of these are of a special hard plaster. The bulk of such dies as are needed on the stretching press is so great that the problem of handling is much simplified by making them of plaster. For some shapes, however, and for long runs, the toughness of this zinc alloy is needed. A special technique has been developed for coring these dies to save weight.

To summarize, the situation in the making of sheet-metal parts for aircraft has constantly

been improved since an alloy especially suited to the purpose of making the dies became available. The steady increase in the number of planes being produced has brought about a shift to power presses of various types in order to cut down the number of man- and machine-hours per part. The drop-hammer is no longer expected to do every forming job, although it still occupies an important place in the industry. The router is no longer the chief tool in the making of blanks, although it is still indispensable for many purposes.

* * *

The Tool Engineer's Place in Modern Industry

When a design or an idea is born, we should first look to the tool engineer to offer his final analysis of whether or not the product can be successfully made. In plants where this practice has been adopted, the tool engineer has the opportunity to analyze the product from a production viewpoint, and show how certain changes and modifications can be made to eliminate expenses and costs which might otherwise be overlooked. Often the product can be picked apart, piece by piece, enabling redesign, if necessary, to conform with modern-day manufacturing practice.

We should always remember that the design of a product is one thing, and the method of making it is another. Both must tie in with each other, because any product, no matter how efficient it may appear, is not better than the tools used for its manufacture. The tool engineer, therefore, is as important in our industrial machine as the designer who is called upon to develop a product, because without tools and a means of producing economically, the most needed type of product would be restricted. The tool engineer, therefore, should become recognized as a part of management.—*Frank W. Curtis, Past-President of the American Society of Tool Engineers*

* * *

When a man has not the courage to make a decision on the strength of his own knowledge, convictions, and judgment, he suggests the preparation of a report.

Fig. 12. All of the Parts Shown were Blanked and Formed on Kirksite Dies in Punch Presses. Included in the Group are Pieces Made of 0.023-inch Inconel and 0.125-inch Alclad

Special Equipment Increases Production of High-Speed Assembly Press

FASTER and easier handling of assembly work has been accomplished in one plant by building a high-speed assembling press and equipping it as shown in the accompanying illustration. The principal operating units of this press consist of a Vickers hydraulic system, and a Tomkins-Johnson cylinder, located at *A*.

The hydraulic system includes the control valve *B*, adjustable relief valve *C*, cylinder gage *D*, setting gage *E* for adjustable relief valve, and fixed relief valve *F*. Pump *P* is driven by a motor at *G*.

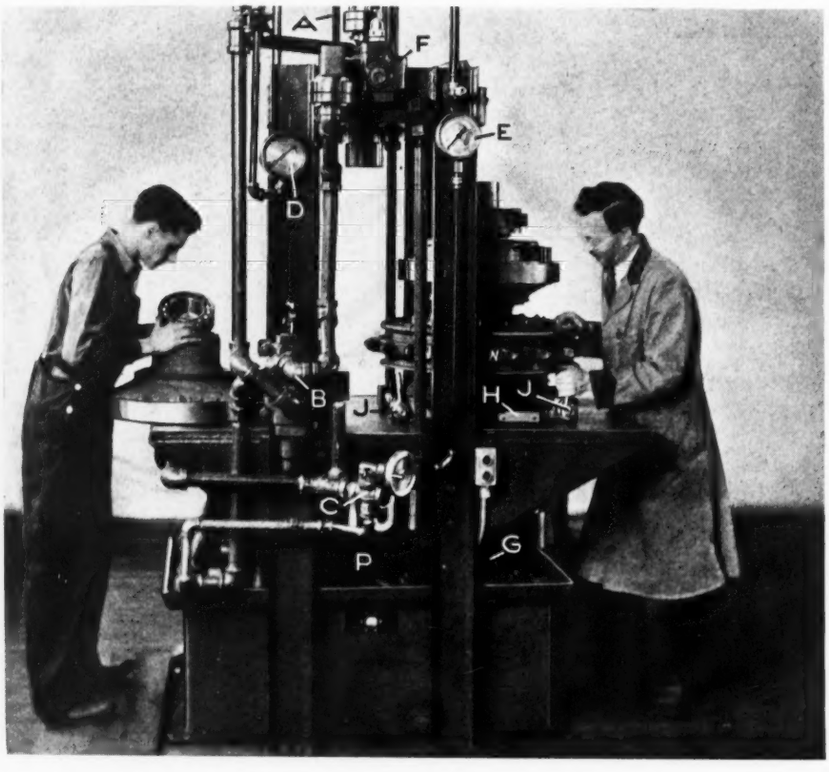
The press has a long table which extends out into the open, both to the left and right of the uprights. This table is three times as long as it is wide, and consists of a smooth steel slab. The space provided by the table serves to practically double the production rate of the press by furnishing two assembly positions. Each position is served by a jib and hoist. The stacked-up parts can be slid under the press ram, pressed together, and withdrawn in a matter of seconds.

Heavy parts to be assembled can be easily rolled into the pressing position on a steel platen *H* having lugs at the corners which are bored to receive two transverse axles, front and rear, each of which is turned eccentric at the ends. The eccentric parts of the axles carry ball bearings which serve as wheels. The wheels permit the work to be easily pushed under the press ram or withdrawn. A 180-degree turn or rotation of the axles by means of small levers *J* lets the press platen down so that it rests on the table, where it can take the full load of the hydraulic press.

* * *

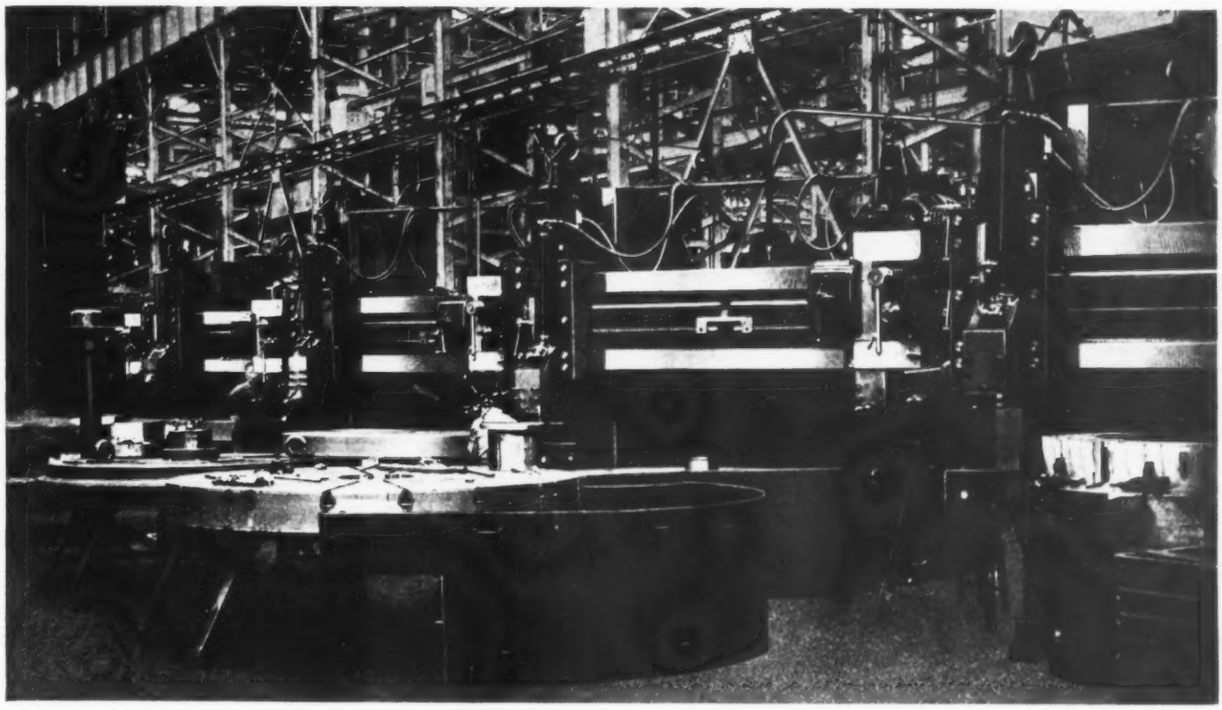
Standards Developed by the American Society for Testing Materials

The American Standards Association recently approved, as American standards, twenty-three standards and specifications developed by the American Society for Testing Materials, covering a broad group of materials. All of these standards are available from the American Standards Association, 29 W. 39th St., New York City. The price is 25 cents per copy.



Assembling Press Provided with Two Loading Stations and Special Work-handling Equipment

Automobile-Body Stamping Plant Builds Boring Mills for Tank Production



How the Fisher Body Division's Main Stamping Plant has been Converted to the Building of a Line of Machine Tools for Tank-Turret Production

Approved for Publication by the War Department

EVERY automobile plant in the country is now engaged in building some type of equipment for the war—aircraft, tanks, guns, shells, marine engines, or some other war requirement. An unusual type of conversion, however, is presented by the main stamping plant of the Fisher Body Division of the General Motors Corporation, which is now building large vertical boring mills of a design especially adapted for use in the manufacture of tank turrets. Two sizes of boring mills are being built—100- and 112-inch.

These machines were designed by the Consolidated Machine Tool Corporation. They are of a heavy-duty standard type, except that the cross-rail is not movable up and down on the housings, but is doweled in a permanent position. The height of the fixed cross-rail, of course, is determined by the work for which these boring mills are especially intended. If, at some future time, it should be required to have the cross-rail movable up and down on the housings, the necessary elevating mechanism could easily be provided.

The speed with which this plant was converted to machine tool manufacture was remarkable. The output today would do credit to any machine tool plant regularly engaged in this work. In addition to boring mills, the company has also turned out a large number of planers designed by the Liberty Planer Co.

In the manufacture of the boring mills, conventional methods are being used as far as the chief machining operations are concerned. Jigs and fixtures are employed wherever the work can be facilitated or speeded up by such means. This is especially true in the assembly, where some unusual jigs and fixtures have been devel-

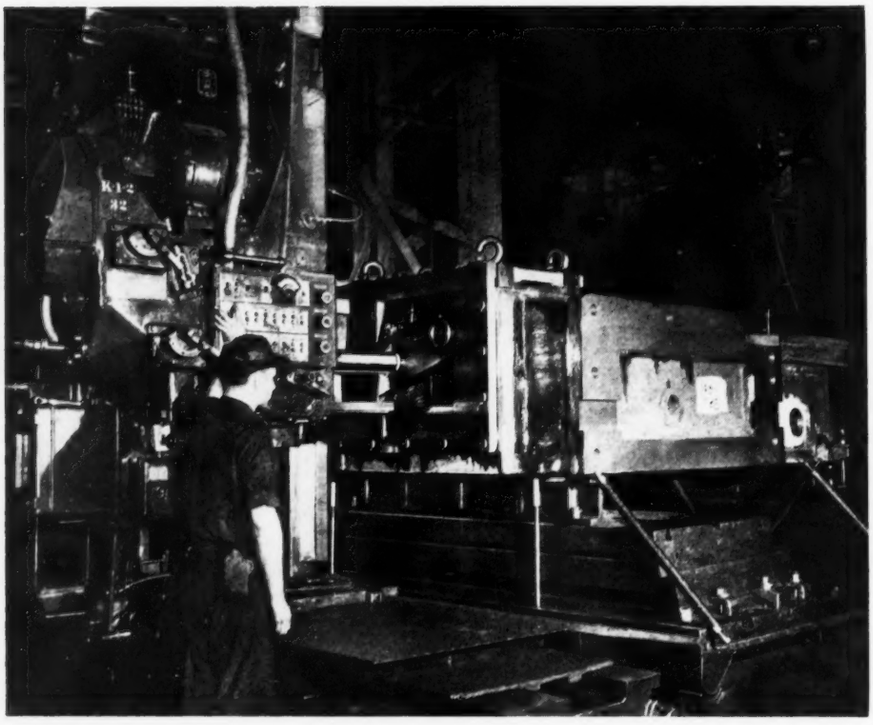


Fig. 1. Boring the Rear-bracket Bearing in a Boring-mill Bed Casting, Using an Available Keller Machine

oped that greatly facilitate the work. There are also some unusual adaptations of machines that were available in the tool and die shop of the company; these machines are now doing work for which they are well suited, but for which they were not originally designed.

For example, four Keller mechanical die-sinking machines previously employed in the tool and die shop are now being used for boring a number of the bearing holes in the bed castings of the boring mills (see Fig. 1). Milling operations are also being performed on Keller machines. Obviously, these machines were not originally designed for such simple work as plain milling; but since they were available and since new milling machines could not be obtained without waiting a considerable length of time, these machines were pressed into service.

As mentioned, jigs and fixtures are provided for practically every operation that can be facilitated by such means. Quite an elaborate fixture is provided for the assembling and testing of the cross-rail (see Fig. 2). This fixture, in many respects, duplicates the housing arrangement of the boring mill itself, but all parts of the cross-rail and tool-heads are more accessible in the

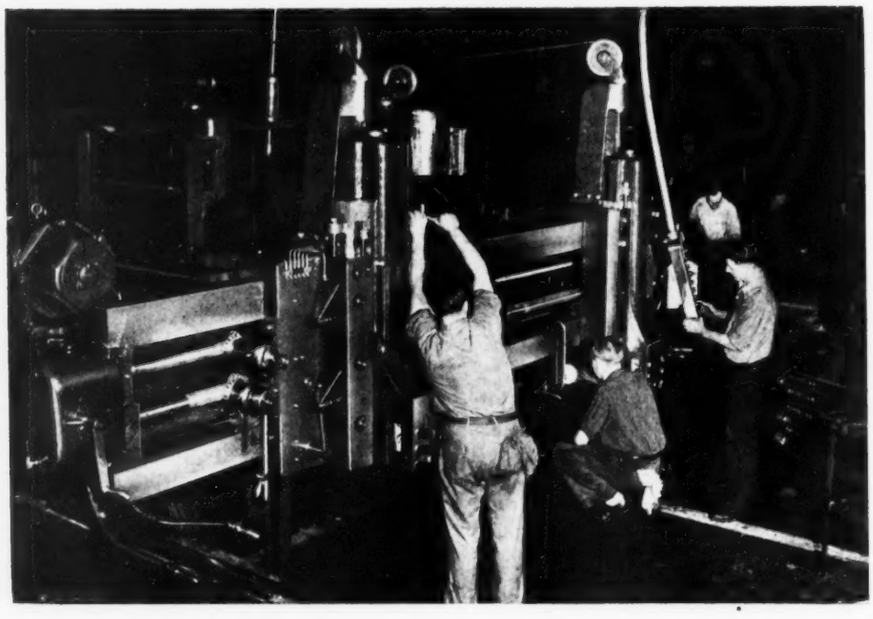


Fig. 2. Inspecting and Testing the Assembled Cross-rail on a Fixture before Securing it to Boring-mill Housings

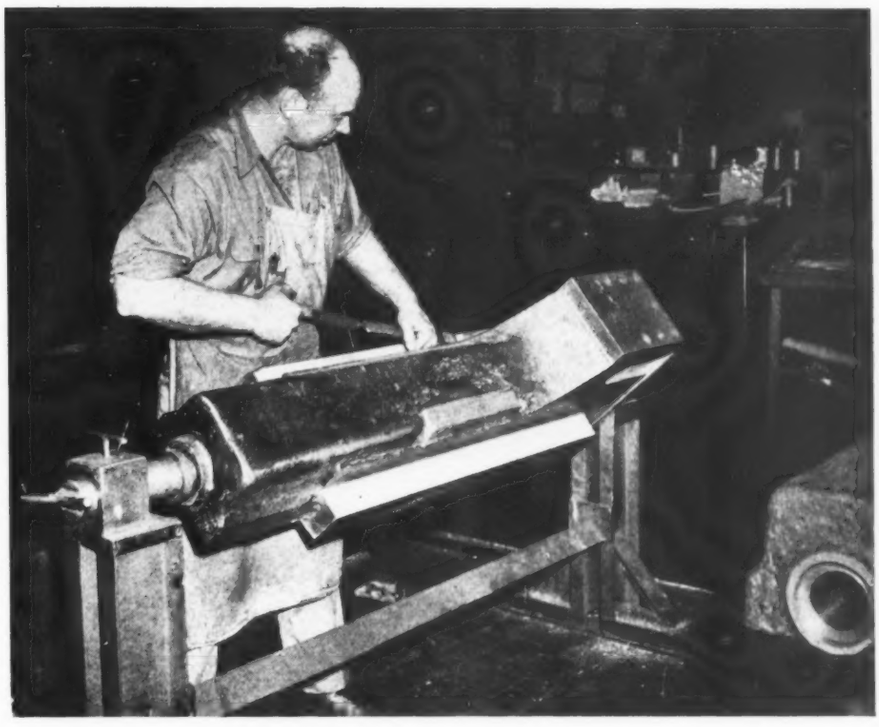


Fig. 3. Convenient Swivel Type of Fixture Used for Holding Rams while Performing a Scraping Operation

fixture than they would be if assembled on the machine. Even counterweights are provided, and the electrical wiring and controls on the fixture are duplicates of those on the machine, so that the cross-rail, with its complete equipment, can be assembled and tested, ready to be put on the boring-mill housings and doweled in place.

Swivel fixtures are provided for a great many operations, so as to make the work easily accessible. One of these, for use in scraping the ram, is shown in Fig. 3. Another, used for turning the cross-rail to any angle while scraping, may be seen in Fig. 4. For assembling the cross-rail prior to placing it in the testing fixture shown in Fig. 2, a swivel fixture is employed, so that any part of the cross-rail can be turned to a convenient position for the operator. A similar assembly fixture is provided for the rams, so that they can be tipped to any angle required.

Another fixture is being used (as shown in Fig. 5) for assembling and checking the gears before they are actually put in place in the cross-rail assembly. This fixture allows complete visibility of the gears and assures proper meshing

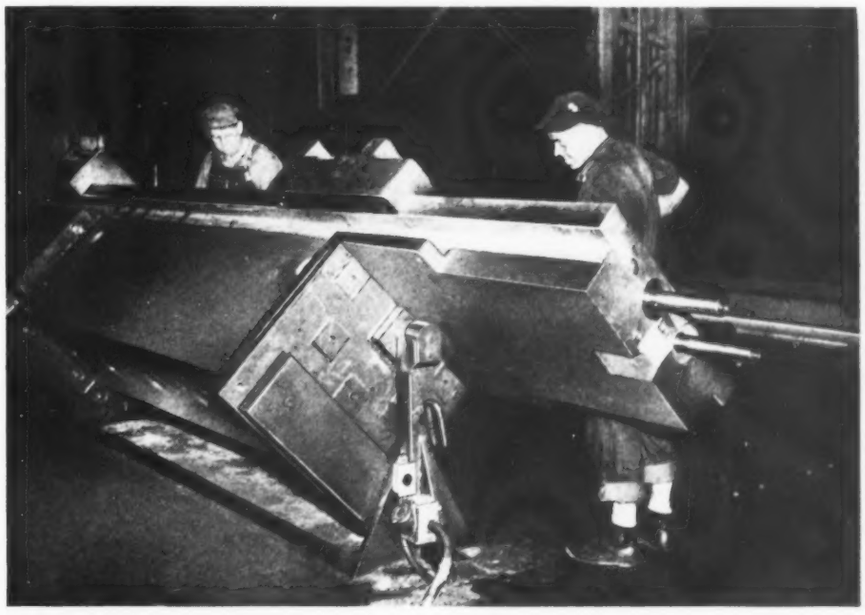


Fig. 4. Swivel Fixture Employed for Turning the Cross-rail to Convenient Positions during Scraping Operations

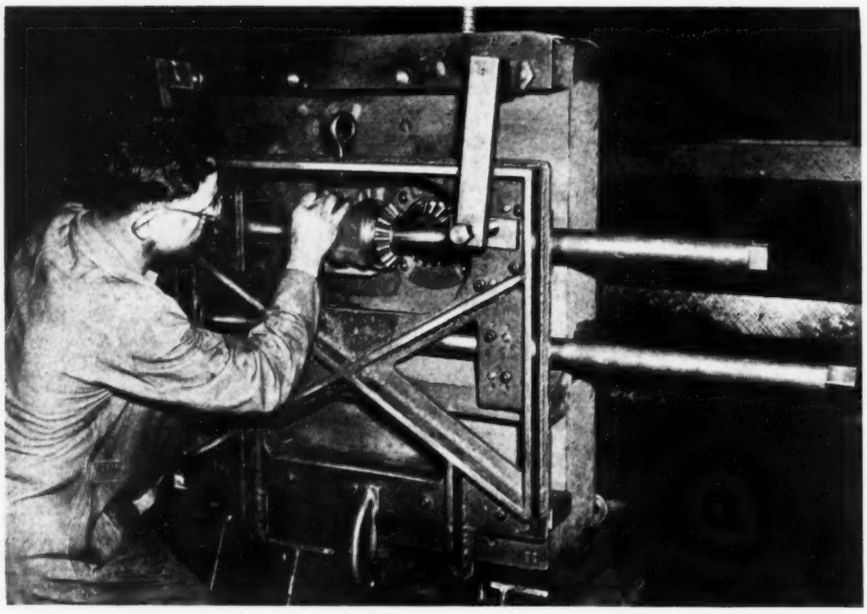


Fig. 5. Jig Used for Assembling and Checking the Gears before They are Finally Assembled in the Cross-rail

of the teeth and accurate assembly. In fact, all parts that can be sub-assembled are handled in that way previous to the final assembly.

Fig. 7 shows the jig and indexing arrangement used for boring various bearing holes in the bed casting. To provide for convenient indexing, a boring mill table is used as an indexplate, the bed being supported by and attached to this table. This indexing arrangement permits boring the main spindle hole, and drilling and tapping accurately located holes on each side for mounting the uprights. The boring and drilling are performed on a floor type drilling machine made by the Fisher Body Division, provided with a Morris head.

Another interesting method is used for the facing, turning, and counterboring operations on the table itself. A lining-up jig or fixture is attached to the bottom side of the table, with that side turned upward. After the fixture has been properly leveled up with adjusting screws, the table is simply turned over, and is then ready for facing.

Fig. 6 shows an interesting arrangement used in drilling eighty holes in the boring mill table. In this case, a Delta drill post is mounted in the

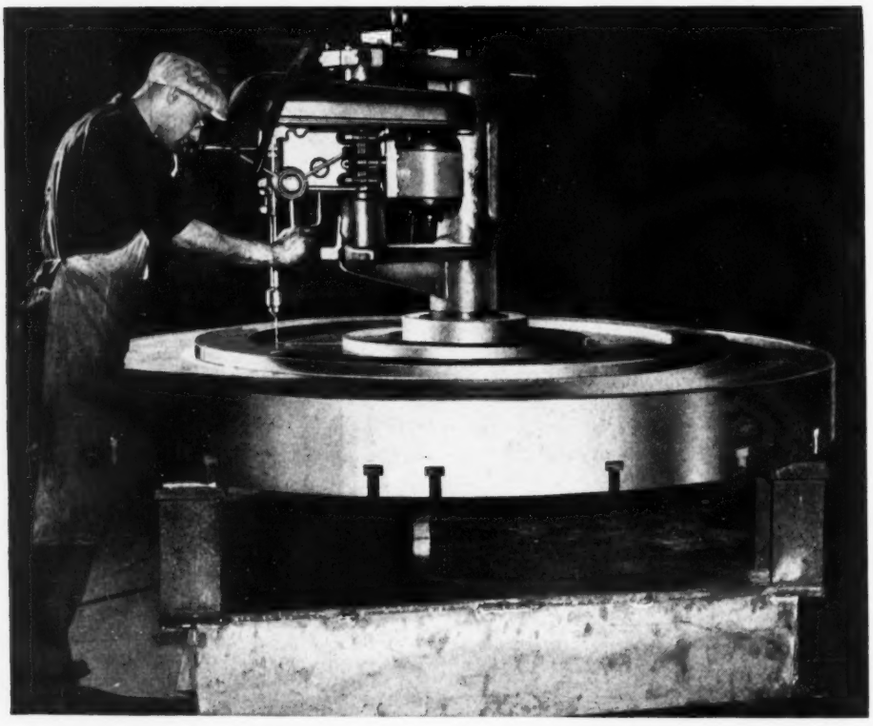


Fig. 6. Convenient Arrangement for Drilling and Tapping Eighty Holes in the Table of the Boring Mill

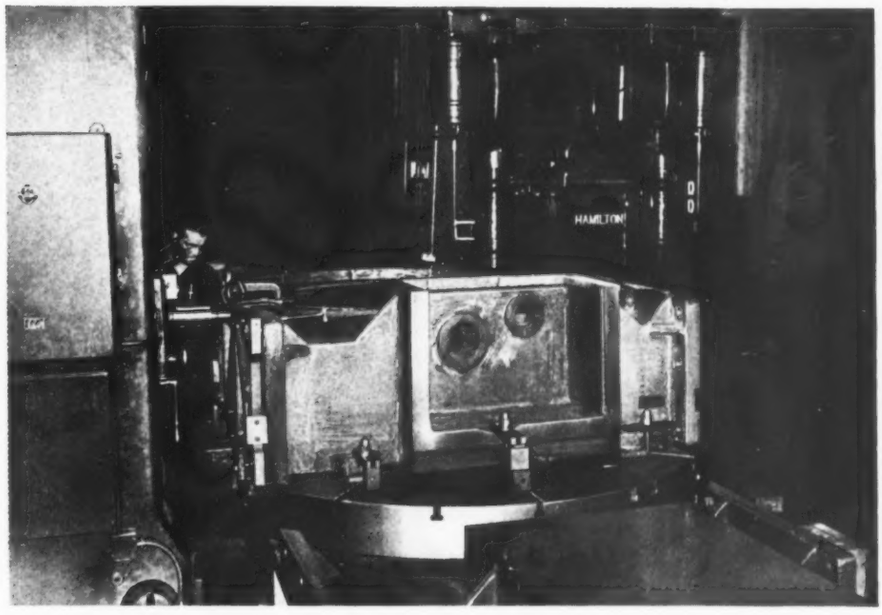


Fig. 7. Jig and Indexing Arrangement Used for Boring the Bed Casting and Drilling Screw Holes in Each Side

center bearing of the table, and the arm of the drill is swung around for drilling the different holes. This assures correct radial location of all the holes, and enables them to be drilled more quickly than if the table were placed under a large radial drill, the arm and head of which would both have to be moved to obtain the correct location.

Whenever possible, work that can be handled on a unit mass-production basis is so produced. For example, all the electric wiring is handled as a production job, and made ready in advance, so that it can be merely fitted and adjusted in place on the boring mill at the time the machine is assembled.

A feature that greatly facilitates the handling of the heavy castings used in these large boring mills is the use of special hooks in every instance where heavy castings or jigs and fixtures must be handled by a crane. Instead of using chains and slings, which is so frequently done, hooks are attached to the parts to be handled in such a manner that the lifting can be quickly done without adjusting slings. The crane hook is simply attached to the hook or eye in the casting. In the case of the boring mill table, for

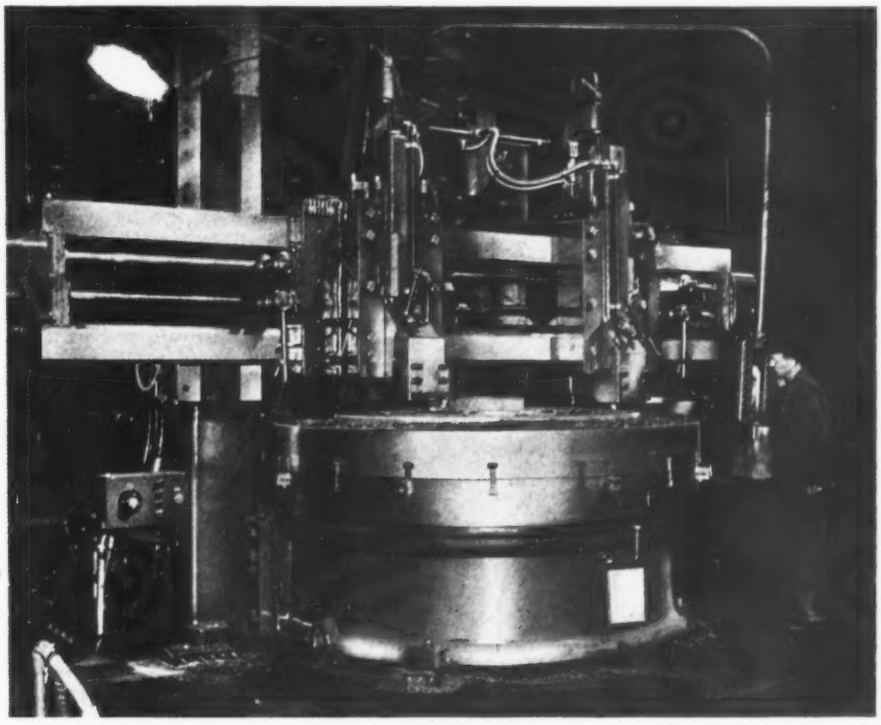


Fig. 8. Completed Boring Mill in Operation in the Plant where it was Built, Turning the Table for Another Mill

example, a hook is firmly attached to one of the T-slots. The crane hook engages the hook on the table, and when the table is lifted, it is always held in a certain predetermined position, and can be easily put down, after moving, in exactly the position wanted. Figs. 1, 5, and 6 show such hooks attached to castings or fixtures. By this means, large castings are handled as easily and quickly as small ones.

The provisions for easy and rapid handling of all parts save much time throughout the manufacturing and assembly operations. Thus, for example, a boring mill weighing 50 tons, after having been finally assembled and tested, can be taken apart, ready for shipment and crating, in from two and one-half to three hours.

This brief outline of some of the outstanding features in the work of building boring mills in a plant equipped for making automobile-body stampings indicates how readily American industry has adapted itself to the changes necessitated by the war requirements, and how much thought and ingenuity have been applied to the solution of the problems presented.

Harold V. Coes Elected President of A.S.M.E.

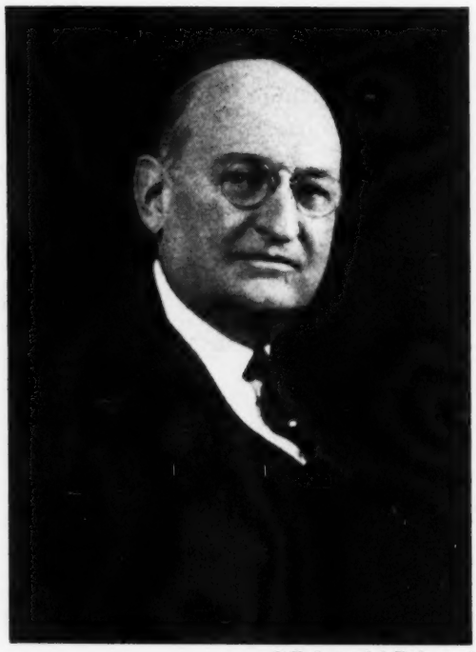
HAROLD VINTON COES, vice-president of Ford, Bacon & Davis, Inc., New York City, has been elected president of the American Society of Mechanical Engineers for the coming year. Mr. Coes will take office at the annual meeting in New York early in December.

Mr. Coes was born in Hyde Park, Mass. He received the degree of Bachelor of Science at the Massachusetts Institute of Technology in 1906. From 1908 to 1911, Mr. Coes was mechanical engineer and assistant to the president of the Liquid Carbonic Co., Chicago, Ill., where he assisted in the design of, and built and operated what was then the largest liquid-carbonic-acid plant in the world, at Cambridge, Mass. Later he became principal engineer of Lockwood, Green & Co., of Boston, Mass. In 1914, he became vice-president and general manager of the Sentinel Mfg. Co., New Haven, Conn., manufacturer of automatic gas appliances.

In 1917, he joined the staff of Gunn, Richards & Co., of New York, as industrial engineer, in which capacity he reorganized production in munitions plants in Canada. He was so successful in this work that he was asked to join the staff of Ford, Bacon & Davis, Inc., in 1918. As industrial engineer with this concern, he assisted in the design of munitions plants and of the Richmond, Va., plant of the Emergency Fleet Corporation, for the manufacture of single-ended Scotch marine boilers for troop transports. Representing his company, he also served as acting general manager of the Platt Iron Works, Dayton, Ohio.

From 1924 to 1928, he was director, vice-president, and general manager of the Belden Mfg. Co., Chicago, Ill. In 1928, he returned to Ford, Bacon & Davis, Inc., as manager of the industrial department, and devoted his attention to problems of administration and industrial management. Representing his company, he served for a year as director and executive vice-president of the Vulcan Iron Works, Wilkes-Barre, Pa. In 1937, he became a partner of Ford, Bacon & Davis, Inc., and in 1941, vice-president.

Mr. Coes has been a member of the American Society of Mechanical Engineers since 1907, and has taken an active part in the Society's work for many years. He was manager of the Society in 1929-1932, and vice-president in 1927 and again in 1932-1934. He has been active on a great many of the Society's committees, and served as chairman of the Finance Committee for several years. At present, he is on the Special Committee on Depreciation and on the Special Committee on War Production. He has also represented the Society on the board of the United Engineering Trustees, and has served both as president of that organization and as chairman of its Finance Committee. He was one of three Americans sent to attend the International Budgetary Conference at Geneva, Switzerland, in 1930.



© Underwood & Underwood

Harold V. Coes, Newly Elected President of the A.S.M.E.

LOADS AND DEFLECTIONS OF PHOSPHOR-BRONZE ROUND-WIRE HELICAL SPRINGS—2

Outside Diameter of Spring, Inches	Diameter of Wire, Inches							
	0.036	0.040	0.045	0.051	0.057	0.064	0.072	0.081
	Upper Figure, Maximum Safe Load P, in Pounds; Lower Figure, Deflection y, in Inches per Coil							
1/8	3.48 0.00196	4.48 0.00143	.....	.....	.....	.....	.....	.....
5/32	3.06 0.00419	4.02 0.00331	5.48 0.00245	7.42 0.00170	.....	.....	.....	.....
3/16	2.63 0.00724	3.56 0.00592	4.89 0.00460	6.79 0.00341	9.05 0.00254	.....	.....	.....
1/4	2.05 0.0161	2.78 0.0134	3.90 0.0109	5.53 0.00862	7.57 0.00688	10.4 0.00532	14.0 0.00393	.....
5/16	1.67 0.0280	2.26 0.0239	3.21 0.0200	4.59 0.0162	6.34 0.0132	8.74 0.0107	12.2 0.00841	16.7 0.00642
3/8	1.41 0.0435	1.92 0.0375	2.71 0.0316	3.90 0.0262	5.39 0.0219	7.52 0.0180	10.5 0.0146	14.5 0.0114
7/16	1.21 0.0622	1.66 0.0545	2.35 0.0461	3.38 0.0385	4.68 0.0325	6.58 0.0276	9.22 0.0223	12.9 0.0181
1/2	1.07 0.0846	1.46 0.0739	2.07 0.0634	2.98 0.0532	4.14 0.0454	5.82 0.0384	8.20 0.0320	11.5 0.0262
5/8	0.858 0.139	1.18 0.123	1.67 0.106	2.41 0.0900	3.37 0.0780	4.74 0.0666	6.68 0.0561	9.38 0.0468
3/4	0.718 0.208	0.982 0.183	1.40 0.159	2.02 0.137	2.81 0.118	3.96 0.102	5.62 0.0868	7.96 0.0740
7/8	0.618 0.290	0.848 0.257	1.21 0.224	1.74 0.192	2.42 0.168	3.43 0.146	4.86 0.125	6.90 0.107
1	0.541 0.386	0.741 0.342	1.05 0.298	1.53 0.258	2.13 0.226	3.00 0.196	4.26 0.170	6.04 0.145
1 1/8	....	0.660 0.440	0.938 0.384	1.36 0.334	1.90 0.296	2.68 0.256	3.79 0.220	5.40 0.190
1 1/4	....	....	0.846 0.482	1.23 0.418	1.71 0.366	2.42 0.322	3.43 0.278	4.86 0.241
1 3/8	....	....	0.773 0.592	1.12 0.513	1.56 0.452	2.20 0.394	3.12 0.342	4.44 0.298
1 1/2	....	....	....	1.03 0.618	1.43 0.544	2.03 0.478	2.87 0.416	4.08 0.362
1 5/8	....	....	....	....	1.32 0.647	1.87 0.566	2.66 0.494	3.78 0.432
1 3/4					.....	1.74 0.663	2.47 0.580	3.52 0.506
1 7/8					.....	.....	2.31 0.672	3.27 0.586
2					.....	.....	2.16 0.770	3.08 0.674

All values in this table are based on 30,000 pounds per square inch fiber stress. The values given are for severe service. For average and light service, multiply by 1.25 and 1.55, respectively.

For maximum safe load and deflection formulas, see Data Sheet No. 475, October, 1942.

Compiled by J. I. Hommel
Westinghouse Electric & Mfg. Co.

LOADS AND DEFLECTIONS OF PHOSPHOR-BRONZE ROUND-WIRE HELICAL SPRINGS—1

Outside Diameter of Spring, Inches	Diameter of Wire, Inches							
	0.0142	0.0159	0.0179	0.0201	0.0226	0.0254	0.0285	0.032
	Upper Figure, Maximum Safe Load P, in Pounds; Lower Figure, Deflection y, in Inches per Coil							
1/8	0.255 0.0114	0.357 0.00968	0.504 0.00805	0.702 0.00662	0.986 0.00542	1.37 0.00432	1.89 0.00344	2.59 0.00266
5/32	0.208 0.0196	0.290 0.0167	0.410 0.0141	0.576 0.0119	0.811 0.00990	1.13 0.00811	1.58 0.00664	2.19 0.00532
3/16	0.174 0.0297	0.243 0.0257	0.346 0.0220	0.486 0.0187	0.686 0.0157	0.960 0.0131	1.35 0.0110	1.88 0.00895
1/4	0.132 0.0568	0.184 0.0492	0.262 0.0426	0.372 0.0372	0.525 0.0316	0.738 0.0268	1.03 0.0227	1.45 0.0193
5/16	0.106 0.0921	0.148 0.0810	0.211 0.0702	0.298 0.0608	0.422 0.0526	0.598 0.0452	0.841 0.0389	1.18 0.0331
3/8	0.0887 0.137	0.124 0.120	0.177 0.105	0.249 0.0912	0.352 0.0798	0.498 0.0682	0.704 0.0592	0.993 0.0506
7/16	....	0.107 0.167	0.152 0.146	0.215 0.127	0.304 0.111	0.430 0.0965	0.606 0.0839	0.858 0.0726
1/2	....	....	0.133 0.194	0.188 0.170	0.266 0.148	0.378 0.130	0.533 0.113	0.750 0.0980
5/8					0.214 0.239	0.304 0.209	0.427 0.183	0.606 0.160
3/4					.....	.....	0.358 0.272	0.508 0.239
7/8					.....	.....	.....	0.434 0.331

All values in this table are based on 30,000 pounds per square inch fiber stress. The values given are for severe service. For average and light service, multiply these values by 1.25 and 1.55, respectively.

The tables in these Data Sheets, Nos. 475 and 476, and in Nos. 477 and 478 to follow, give the maximum safe load P in pounds, and the deflection y in inches per coil for round phosphor-bronze wire springs, using the American Wire Gage (B & S) sizes as the base. These tables eliminate the need for using formulas on a trial basis for a wide range of sizes; at least, they enable the designer to select quickly a spring diameter and wire size that approximates his requirements. If a diameter of wire or spring not covered in this tabulation is needed, the final calculation is made by using the following formulas:

For maximum safe load P in pounds

$$P = \frac{\pi d^3 S}{8DK_1}$$

For the deflection y in inches per coil

$$y = \frac{\pi SD^2}{GdK_1} \text{ in which}$$

S = safe fiber stress, pounds per square inch;
G = modulus of elasticity in torsion (pounds per square inch) = 6,000,000 for phosphor-bronze;
d = wire diameter, inches;
D = mean diameter of spring = outside diameter minus wire diameter;
K_1 = Wahl factor =

$$\frac{4C-1}{4C-4} + \frac{0.615}{C} \text{ where } C = \frac{D}{d}$$

Wahl factor values are given in Data Sheet No. 467 published in June, 1942.

Compiled by J. I. Hommel
Westinghouse Electric & Mfg. Co.

Rifling Machine-Gun Barrels by Broaching

Approved for Publication by the War Department

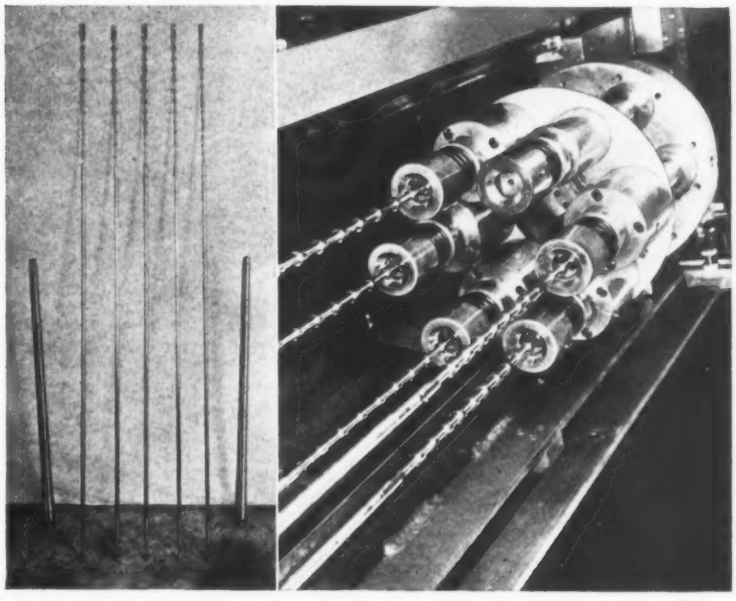


Fig. 1. (Left) Set of Five Broaches Used Successively in Rifling Machine-gun Barrels. Fig. 2. (Right) Broaches for Rifling Gun Barrels Mounted in Rear Carriage of Rifling Machine Shown in Fig. 3

THE method of rifling machine-gun barrels described in this article is the result of several years of development work by the Lapointe Machine Tool Co., Hudson, Mass. The automatic rifling machine shown in Fig. 3 was built by this company for rifling gun barrels and finishing their bores at a high production rate by the newly developed broaching method.

The equipment consists of a special hydraulic, variable-speed, broaching machine on which the necessary control valves for semi- or full-automatic operation have been installed. As broaches for rifling machine-gun barrels are necessarily somewhat fragile, the rifling grooves are finished to the required depth by a set of five broaches. By dividing the work between five broaches, the load on each broach is reduced to a minimum.

A rotating type, six-station drum fixture is employed, in which five stations are in operation simultaneously, while the sixth is used for loading and unloading the work. The broaches shown in Fig. 1 are carried into a circular type carriage, Fig. 4, which is hydraulically operated. The rear carriage, supporting the broaches, as shown in Figs. 2 and 3, first pushes the five broaches through five barrels, held as shown in Fig. 4, which allows the shank of the broaches to pass completely through and automatically engage a quintuple puller. As this engagement is completed, the machine pulls the broaches through the barrels. At the end of the cutting stroke, the revolving holder automatically indexes one-twelfth revolution, and the broaches are returned automatically through five brass tubes which are located equidistantly between the barrels already broached. The broaches are then picked up by the rear carriage and brought back to the original starting position.

At the end of this cycle, the fixture is again rotated one-twelfth revolution, advancing the barrels one position ready for the next passage of the broaches. With this arrangement, one barrel is completed at each cycle of the machine. The time required for this cycle, being approximately 90 seconds, permits ample time for the operator to unload and load the fixture and inspect the barrels as they are taken from the machine.

One of the most important requirements in performing an operation of this kind is to supply a suitable quantity of cutting oil under pressure to lubricate the tools properly as they pass through the barrels. This is accomplished by employing tools of special design and by providing properly located and proportioned ports in the rotating drum.

The rear carriage, in which the broaches are held for a part of the operating cycle, is provided with means for completely sealing the hole in which the broaches are inserted, so that oil under pressure is fed only into the broaches. With this arrangement, an ample quantity of oil is circulated throughout the cut, and this helps to keep the chips away from the cutting edges of the tools.

Limit switches are used along the slides to automatically control the oil, turning on the pressure at the start of the cutting stroke and turning it off just as the last tooth of the broach clears the barrel. The exhaust from a positive pressure pump is turned on the broaches as they are withdrawn from the fixture, so that the chips are washed away very efficiently. This makes

it unnecessary for the operator to clean the broaches manually between cuts.

Another feature of the installation is the positive rotation of the barrels to give the rifling the required twist, obtained through a master lead-bar which is permanently attached to the pull-head. This master lead-bar, in turn, is geared to the six driving spindles on which an adapter that fits the end of the barrel is positively locked.

The loading and unloading is accomplished by a simple, slidable, rear quill, the end of which is of conical shape, designed to receive the muzzle end of the barrel, regardless of variations in diameter. The breech end is inserted in the adapter, in which it is locked by the serrations milled on the barrel. As these barrels are not disengaged at any time during the five cuts, it is only necessary to set the broaching tools in their proper positions relative to the splines already cut by the preceding broach. Once this adjustment is made, the operation becomes a simple matter of loading, unloading, and pushing the starting button. All of the spindles and rotating parts of the fixture are full ball-bearing mounted and have adequate seals that prevent injury to the machine from chips.

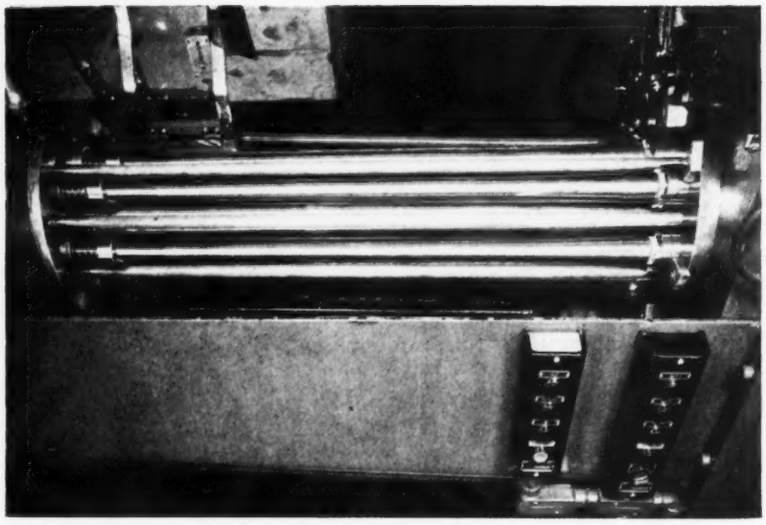


Fig. 4. Indexing Type Six-station Carriage of Machine Shown in Fig. 3, with Gun Barrels in Position for Rifling Operation

The whole unit has been designed to handle barrels from 45 inches in length down to pistol-length barrels, in caliber sizes of from 0.30 to 0.55.

An important feature of the bore-broaching operation is that it is performed after the splines or rifling grooves have been finished. This round broach has a series of spline pilots which are guided on the outside diameter by the splines already cut, so that the bore-finishing broach follows the same spiral line as the rifling

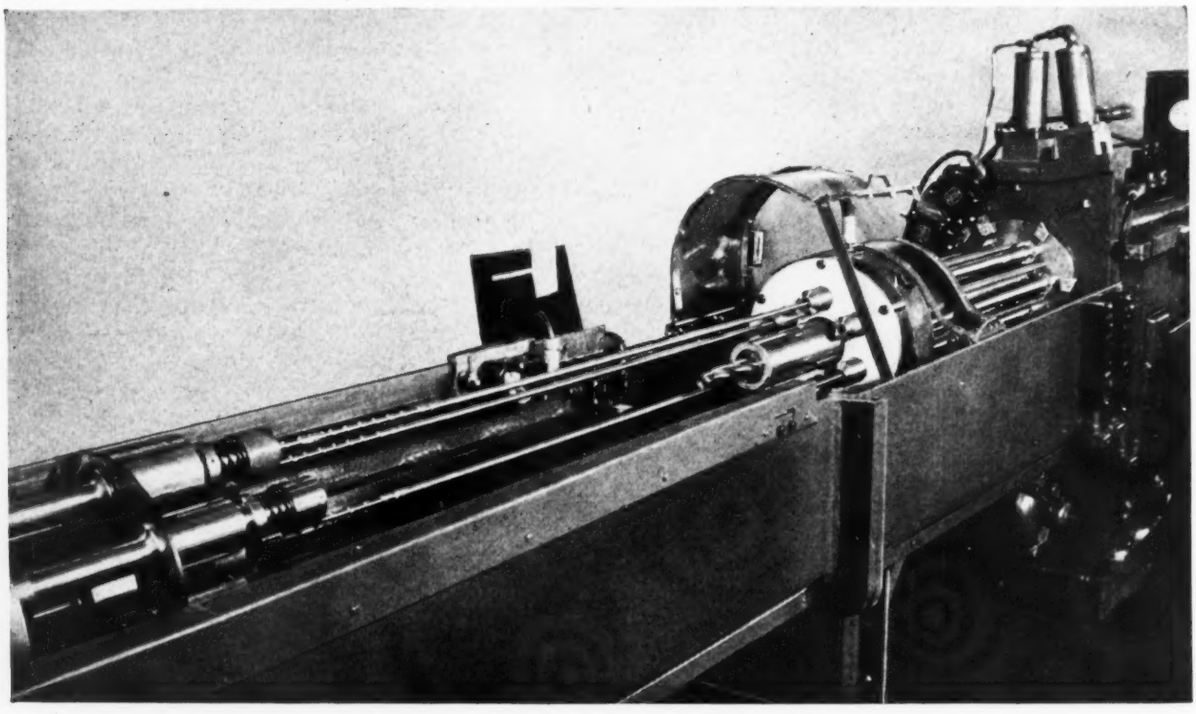


Fig. 3. Automatic Machine Designed for Broaching Rifling and Bores in Machine-gun Barrels

broaches. This tends to produce a finish that has all the tool marks parallel. Approximately 0.005 inch is removed by the bore-broaching operation, which has been found capable of removing all the reamer grooves or tool marks formed in the preceding reaming operation.

Larger units than the one shown are already being made in the same design to handle 20-millimeter caliber barrels in lengths up to 68 inches. The only difference between these larger units and the ones described is that the larger machines use seven broaches instead of five, an eighth station being provided for loading and unloading.

* * *

"Kut-Kost"—A New Metal-Cutting Alloy

A metal-cutting alloy known as "Kut-Kost" has been placed on the market by the General Tool & Die Corporation, 555 Prospect St., East Orange, N. J., after two years of laboratory tests and a long period of commercial application in industrial plants. The new cutting alloy contains a high percentage of tungsten and cobalt, and 1 per cent of boron, along with other metals. The boron is in the form of boron-carbide particles, which are even harder than tungsten carbide.

The material is centrifugally cast at high speed, and is very dense and tough. The fracture of the metal is similar to the fracture of properly hardened high-speed steel, having a close-grained structure with a silver-gray, velvety appearance. The toughness at 61-63 Rockwell C appears to be about the same as that of 18-4-1 high-speed steel. Its toughness at 65-67 Rockwell C appears to be greater than that of cobalt high-speed steel. At 72-75 Rockwell C, its toughness is greater than that of cemented carbides.

The hardness of Kut-Kost at about 1100 degrees F. is greater than at room temperature; but at 1200 degrees F., the hardness is reduced slightly—to just a little below room-temperature hardness. As indicated in the previous paragraph, the hardness can be brought up to 75 Rockwell C by heat-treatment.

The new cutting material is available in three grades, known as V, X, and XV. The only difference in these grades is the hardness, since the composition is the same.

Grade V has a hardness of 61-63 Rockwell C, and is used for heavy roughing cuts on ferrous metals with feeds of from 1/32 to 1/8 inch. At this hardness, the alloy is capable of taking heavy interrupted cuts in tough iron and steel.

Grade X, which is of 65-67 Rockwell C hardness, is known as a general-purpose grade. It is used for medium roughing and semi-finishing cuts on ferrous materials, and for heavy roughing cuts on non-ferrous materials. The feed recommended on ferrous metals is from 0.010 to 1/32 inch. The feed on non-ferrous metals may be anything of which the machine in which the tool is used is capable.

Grade XV is of 68-70 Rockwell C hardness. It is used for finishing cuts on ferrous metals and for general use on non-ferrous materials.

There will also be a Grade XX which will have a hardness of 72-75 Rockwell C. This grade is recommended only for very light cuts on either ferrous or non-ferrous metals. It will not be listed, because of the tendency of users to pick out too hard a grade of cutting tools. This often defeats the purpose of securing longer tool life because of the lower strength of the tool at this high hardness.

A speed of from 60 to 70 per cent of that used for carbide tools, operating under favorable conditions, is recommended for Kut-Kost tools. An increase in feed of from two to four times that used for carbide tools is also recommended. The greater toughness of Kut-Kost makes this possible. The new tool material operates most efficiently when the cut generates high heat, because the material increases in hardness at temperatures up to 1100 degrees F. When Kut-Kost fails to give good results, it is usually due to the wrong choice of hardness or grade. It should again be emphasized that too hard a grade for the work in hand should not be chosen.

The new tool material can be ground as easily as high-speed steel, and is ground on the same type of abrasive wheels. The makers recommend the "dubbing off" of the fine cutting edge when machining medium work, and severely "dubbing off" the cutting edge for heavy work. On very severe or "jump" cuts, a land may be stoned at about 45 degrees to the cutting edge. The width of this land should be from 15 to 25 per cent of the feed per revolution used.

Since the new cutting material is permanently softened or tempered by very high heat, it can only be brazed successfully without drawing the temper through a special brazing technique that has been developed by the General Tool & Die Corporation. In the annealed state, the material has a hardness of 50-52 Rockwell C, and consequently, cannot be machined with ordinary cutting tools.

Owing to the scarcity of alloys, Kut-Kost is supplied as solid bits only in the following sizes: 1/4 by 1/4 by 2 inches; 5/16 by 5/16 by 2 1/4 inches; 3/8 by 3/8 by 3 inches; and 1/2 by 1/2 by 4 inches. Larger sizes than these must be tipped with Kut-Kost tips. At present, only square and rectangular pieces can be cast successfully. Round bits, if required, must be ground from the square pieces.

Engineering News Flashes

Electronic Robot Measures Creep of Metals

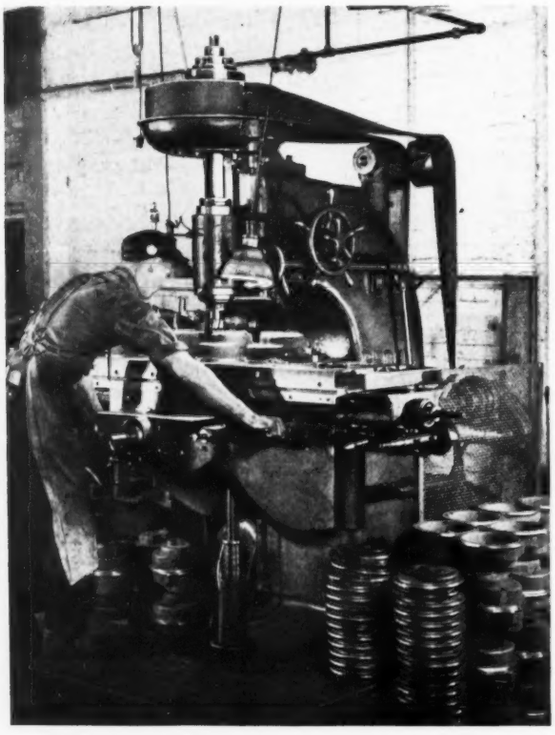
An electronic robot is being used in the General Electric research laboratory at Schenectady, N. Y., for measuring the rate at which metals flow when heated and subjected to stress. Not only does this release, for other important work, the attention of a man who formerly watched the metal sample through a microscope, but the robot is also more accurate than any human observer could be, and more reliable in recording his findings. Furthermore, he is able to watch all day without getting tired.

So-called "creep tests" are extremely important in high-temperature work. Since a steam turbine, for example, operates with greater efficiency, the higher the temperature, metallurgists try to create alloys that will hold their shape under high stress at the greatest possible operating temperatures.

In making creep tests, a thin wire of the metal is used through which an electric current is passed to heat it to, say, 2000 degrees F. The wire is enclosed in a glass cylinder which protects it from air currents and permits the test to be made, if desired, in an atmosphere of nitrogen, thus preventing rusting due to the oxygen in the open air. A weight is attached to the wire. Formerly, the observer making the test watched the wire through a microscope focussed on the lower end, and measured the slow stretching, which might be as much as one-half of 1 per cent an hour. Now these measurements are made automatically through the electronic device mentioned, the principle of which may be demonstrated by means of a flashlight and two combs.

Hold one comb over the lens of the flashlight, and let the light shine on a nearby wall. Now hold the other comb over the first, close to it, with the teeth parallel, and move the second comb very slowly. When the teeth of one cover the openings of the other, the light is cut off; but when the second comb moves the width of a tooth, the clear spaces are lined up and light passes through. If the flashlight and first comb were firmly fixed, and the width of the teeth and openings were known, it would easily be possible to measure the movement of the second comb merely by counting the alternations of light and dark.

This is what is actually done. A light shines through a glass grid, ruled with horizontal black



By Giving Old Machines New Speeds, Many Superannuated Machine Tools have been Pressed into Service During the Present Emergency. The Illustration Shows an Old Becker Vertical Milling Machine, which was Acquired by the Indianapolis Plant of Continental Machines, Inc. It was Rebuilt; and by Applying the All-electric Adjustable Speed Drive Developed by the Reliance Electric & Engineering Co., Cleveland, Ohio, This Machine is Now Actually Performing to Equal, if not Better Advantage than Years Ago, when New

A Photo-controller Unit Installed on a Press in a Westinghouse Shop to Prevent Accidents. The Unit is Installed in Such a Position that if the Worker Reaches too Far into the Machine, He Interrupts a Beam of Light and Automatically Prevents the Machine from Starting. The Response of the Control is Instantaneous. The Equipment is Compact and Inexpensive

lines, each 1/250 inch wide and the same distance apart. Attached to the end of the test wire is another such grid, nearly in contact with the first. A lens forms an enlarged image of these grids on the surface of a photo-cell, which converts light into electricity. A very sensitive meter, in which electronic tubes are used, makes a record in ink, on a moving strip of paper, of the changes in current from the photo-cell, and hence of the changes in brightness or the movement of the second grid. In this way, it is possible to measure an extension of the wire as small as 0.0001 inch.

Lucite Magnifying Lenses on Taper Attachments

A magnifying lens made from Lucite methyl methacrylate resin is being applied to the taper attachments of lathes built by the Monarch Machine Tool Co., Sidney, Ohio. The Lucite lens magnifies the graduations on the taper attachment and assists the operator in setting the attachment more accurately than could otherwise be done. Lucite is a material made by the Plastics Department of E. I. du Pont de Nemours & Co., Wilmington, Del.

Air-Conditioning Helps to Increase War Production

Reports from plants that have been air-conditioned indicate that production can be increased in a wide range of industries without adding a single machine or worker. Air-conditioning, until recently looked upon solely as something installed for the comfort of the workers, has actually aided industry in speeding up production and improving the quality of the product.

An important problem confronting industry is to increase the efficiency of present facilities, so as to have as many men and women as feasible working in tool-rooms, machine shops, inspection departments, etc. The workers are crowded more than formerly, with resulting increase in temperatures. Air-conditioning is the only "tool" that can be employed to relieve this situation and permit war production to continue unhampered by the slowing down effect of high temperatures and humidity.

Use of Silver Brazing Alloy Triples Production Output

The use of a silver brazing alloy instead of a base-metal brazing alloy for fastening two steel parts of a small switch housing has resulted in a 200 per cent increase in production. The operation involves joining a threaded bushing to the steel housing of a sensitive electric switch. The brazing procedure is simple, and no radical change in design of the product was necessary.

After the parts are cleaned and fluxed, a ring of brazing alloy is placed between the bushing and the box. The assembly is then heated in a gas-fired furnace. At 1175 degrees F., the silver alloy ring melts and flows between the parts, forming a leak-tight joint which is claimed to be stronger than that formed by any previous method. By using this silver alloy, it was found that no grinding was necessary after brazing, and the joints remained leak-tight, even when replating was necessary.

EDITORIAL COMMENT

If the general manager of a large corporation having many branch factories should attempt to dictate the details of procedure to be followed by each branch, and by the various departments in each branch, it is obvious to everyone familiar with industrial operations that he would not be worth much as a manager. A good manager determines general policies and depends on the judgment of able subordinates to carry out the detail work, because it can be done much more efficiently that way.

When the United States Government as the general manager of this nation in warfare attempts to dictate the minute details of business procedure, as is now being done, the Government will ultimately be so overwhelmed by the amount of detail involved that this method will be found highly inefficient and wasteful.

Too Much Regulation is Seldom a Sign of Efficiency

Admitting the usefulness of the general principles of price control, for example, one still may question the necessity for a Washington office to determine whether a shoe cobbler should charge 45 or 50 cents for a certain type of rubber heel, and the necessity for publishing an extensive and detailed bulletin covering many pages on that subject. What the country wants is to see evidences of efficiency and sound business principles in governmental affairs. Everybody is contributing to the utmost to finance the war effort. Those who buy bonds and pay taxes feel that they have a right to expect that nothing be squandered on unnecessary regimentation. The acid test of any governmental activity should be: "Will it help to win the war?"

A union strikes against the enforcement of a wage ruling made by a Government agency—the War Labor Board. It defies the authority of the Government, since the War Labor Board is an agent of the Government. Faced with this challenge, the Government decides to seize the manufacturing plant involved in the strike and to operate it. This procedure amounts to punishing the owners for the defiance of the strikers; furthermore, the shift from the experienced owner-management to Government-management is likely to interfere with production.

Fair Play is All that Industry Asks of Government

In the case cited, we face a ruling by the Government to the effect that a group of workers, dissatisfied with a Government decision, have only to go on strike in order to make the Government deprive the employers of the control of their property. Is this fair? Is this in accordance with the time-honored principles of justice always associated with our American institutions? The fact that the workers later requested that they be permitted to work for the owner-management rather than the Army-management does not change the basic principles involved.

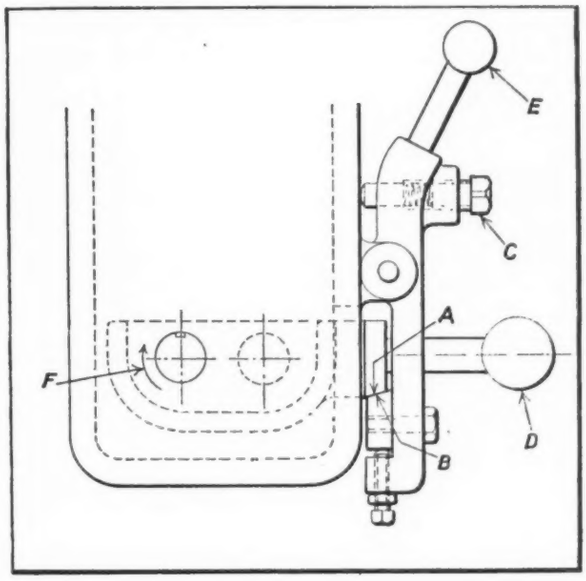
The *New York Times*, commenting upon this case, which is that of the Bayonne plant of the General Cable Corporation, points out that the "course of action open to the Government, and obviously the right one, would have been to remove the picket lines and invite the men back to work. If the strikers did not wish to take advantage of this guarantee of safety, other workers could and should be found to take their places. In this case, the strikers could hardly expect to retain any favored status which they may have enjoyed, on the ground of indispensable service, under the Selective Service Act. . . . Men who choose not to work because they dislike a ruling of the Government cannot expect to have it both ways in the matter of exemption from military service. In a case of this kind, the issue should be work or fight."

* * *

As far as the effect on the nation's war effort is concerned, there is no difference between stopping work in a war-equipment factory, with the result that, say, six planes or six tanks are not manufactured during the strike, and deliberately going in and smashing six planes or tanks to pieces. In either case, there are six less pieces of equipment for the defense of the nation.

Ingenious Mechanical Movements

Mechanisms Selected by Experienced Machine Designers as Typical Examples Applicable in the Construction of Automatic Machines and Other Devices



Lathe Feed Overload Tripping Mechanism for Heavy-duty Turning Operations

Overload Feed-Trip Mechanism for Lathes

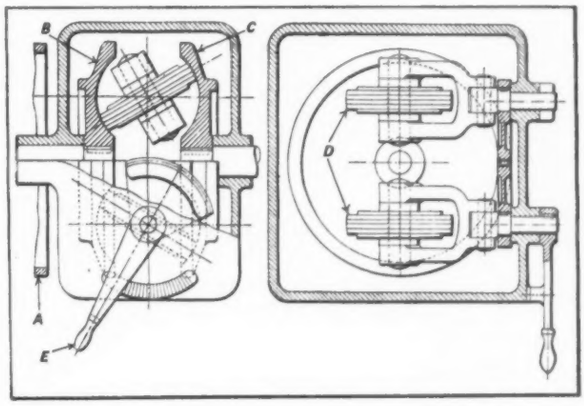
The simple feed-trip mechanism here illustrated was fitted to a heavy shell-turning lathe on which the feed had previously been of the entirely positive type, with no safety device to take care of overloading or jamming. The saddle of this lathe is fed in one direction only—that is, toward the headstock. Had there been a reverse for the feed-shaft, it would not have been possible to use the mechanism described, and some form of slipping or friction device would have been necessary.

A slipping type coupling in the feed transmission had been decided upon, but this proved too difficult to apply, particularly on the existing machines. It was suggested that a slight alteration to the trigger mechanism of the drop-worm would allow it to automatically force itself out of mesh with the worm-gear in the event of overloading or jamming. Such an arrangement would have an advantage over a slipping clutch because, immediately the worm tripped, all stress would be removed from the feed transmission, whereas, with the usual type of slipping clutch, the whole of the feed transmission would be subjected to a heavy load, in the event of a jam, until noticed by the operator.

The simplicity of the mechanism shown can be judged from the fact that, in less than an hour after it was suggested, it had been tried out and found satisfactory. No new parts were made, the only work done consisting of a slight modification of the trigger elements of the drop-worm. Instead of being made practically square, to hold the drop-worm positively in mesh with its gear, the trigger faces *A* and *B* were made at an angle of 15 degrees, so that a downward thrust on *B*, resulting from an overload, would disengage the feed. Set-screw *C* compresses a spring, and can be adjusted to vary the pressure with which the trigger is held in the engaged position. The worm is lifted by knob *D*, and knob *E* operates the trigger to trip the feed. The feed-shaft runs in the direction indicated by arrow *F*.

Friction-Drive Mechanism Designed for Stepless Speed Variation

Speed variation without steps can be obtained by sliding a belt along opposed tapering driving and driven drums; by a V-belt, steel ring, or chain driving between pairs of adjustable con-



Friction-drive Mechanism with Stepless Speed Changes Obtained by Moving Hand-lever

ical disks which permit varying the effective diameters; or by friction disks at right angles. The single-lever control friction drive mechanism shown in the accompanying illustration is designed to give stepless speed variation between a minimum and maximum speed.

While heavy power transmission is not to be expected of friction drives, the arrangement shown possesses the advantage of a double drive. Driving pulley *A* is keyed to the duplex friction bowl *B* and transmits motion to member *C* by means of the two intermediate disks *D*. The disks are mounted in swiveling forks attached to gear segments operated by a single lever *E*. With the disks in the horizontal position, as shown in the right-hand diagram, the friction bowls run at equal speeds. A plus or minus movement of 30 degrees provides a stepless variable-speed range in the ratio of 7 to 1.

Machine for Straightening Fine Wire

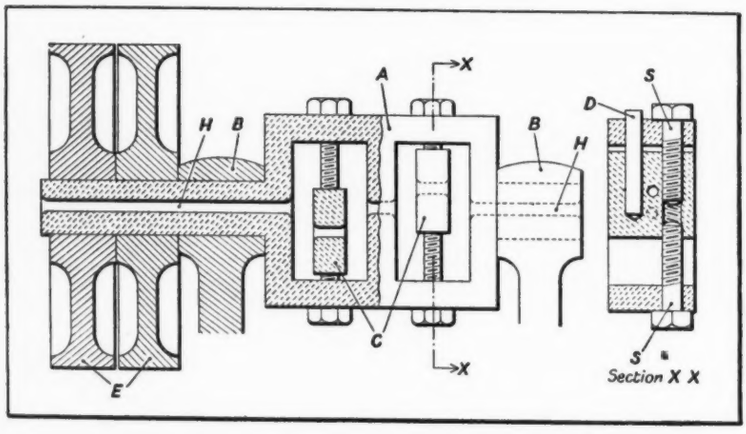
The accompanying illustration shows a comparatively simple machine designed for straightening coiled nickel-silver wire 1/64 inch in diameter. Straight pieces of this wire were required in lengths of 3, 6, and 12 inches. As it is difficult to straighten such short lengths, pieces 2 feet or more in length are straightened on the machine and then cut off to the required lengths. Wire in lengths as short as 2 feet, however, is generally drawn through the straightening machine twice. The end of the wire which leaves the machine last at the first pass is fed in first at the second pass. In some cases, more than two passes of the wire through the machine are necessary.

The machine is not complicated to make or to use. Similar designs are employed in the hosiery machine building trade for straightening the wires on which jacks are pivoted. Frame *A* of the machine is free to revolve in bearings *B*. It is shown driven by belt through the fast and loose pulleys *E*, although any other convenient form of drive can be provided. A suitable speed is about 100 R.P.M. A hole *H*, slightly larger in diameter than the wire to be straightened, is drilled through the center of the frame. Extreme accuracy in the diameter of this hole is not required, 1/8 inch being suitable for wires up to 3/32 inch in diameter.

Supported in slots in the frame *A* are the blocks *C*. These blocks are adjustable lengthwise in the slots by means of the screws *S*, while the dowels *D* prevent the blocks from turning. A hole of the same size as that drilled through the center of the frame is drilled in each of the blocks. These holes are so positioned that they can, by adjustment of the blocks, be aligned with the center hole in the frame, or they can be offset by an amount depending on the diameter of wire to be straightened.

In operation, the wire is fed into the center hole on one side of the machine until about 1/2 inch projects at the other side. This projecting piece is then gripped in a hand vise. The blocks are adjusted to positions that will cause the wire to be bent as it is pulled through the machine. The amount of this bending can best be found by trial, but it should be just sufficient to remove any kinks from the wire. The power is now applied, causing the frame to revolve, and the wire is pulled through the machine.

To prevent the wire from being scored, the ends of the holes in both the bending blocks and the frame should be provided with fairly large radii.



Machine Designed for Straightening Fine Wire

* * *

Normalizing Castings

Commenting on the article "Speeding Up the Seasoning of Castings," on page 147 of September MACHINERY, the Cone Automatic Machine Co., Windsor, Vt., mentions that the normalizing of castings has proved a satisfactory substitute for the old process known as seasoning. Normalizing consists of heating the castings in a furnace to a temperature of 1050 degrees F. for a period of one hour for each inch of wall thickness. The castings are then allowed to cool gradually without exposure to the outside atmosphere. The cast iron is then in a good "state of balance"; if the process is repeated, an additional improvement may be noted. Renormalizing, however, is not as effective as the initial treatment, and improves the structure only to a comparatively small degree.

Care and Maintenance of Portable Pneumatic Tools

The War has Emphasized the Necessity for Care in the Handling and Upkeep of All Mechanical Equipment. Specific Directions for the Care of Pneumatic Tools are Given in This Article

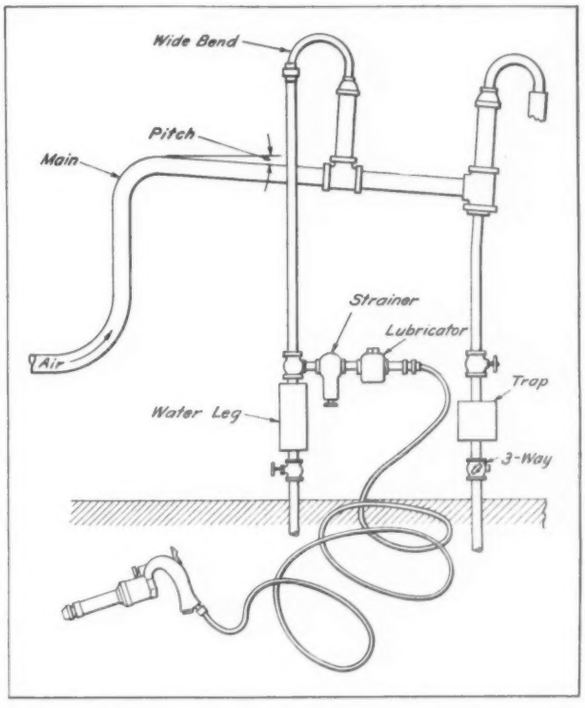
PORTABLE pneumatic tools may be divided into two classes. In one, compressed air operates a mechanism that produces hammer action. In the other, work is done by rotating parts. In the first classification are riveting and chipping hammers, together with tools operating in like manner. In the second are drills, grinders, and other rotating tools.

Portable pneumatic tools are available in a large assortment to meet the specialized requirements of our manufacturing industries. Riveting hammers are designed to drive rivets from the smallest up to and including the 1 1/2-inch size. Such hammers range in weight from 1 1/2 to 35 pounds. Their hitting rate varies between 700 and 4900 blows a minute. A 2 1/4-pound midget hammer, adapted to scaling paint, strikes 10,000 blows a minute.

Pneumatic tools with rotating mechanisms are made in even greater variety. There is a drill suitable for any size hole up to 3 inches in metal and 4 inches in wood. Drill weights range from 1 1/4 to 195 pounds. The speeds start at 20 R.P.M. and end at 25,000 R.P.M. Portable grinders are made in sizes to drive grinding wheels from a fraction of an inch in size up to and including 8 inches. Their weights begin at 12 ounces and end at 16 pounds. The spindle speeds range from 3000 R.P.M. to 70,000 R.P.M. There are also pneumatic reamers, wrenches, and screwdrivers.

Sustained efficient operation depends upon the care tools receive. All pneumatic tools, both large and small, are finely made precision instruments. While designed to withstand strains normal to their use, they must be properly operated and cared for. The large tools used in heavy industry appear to have a slight advantage over their smaller counterparts in being able to withstand more abuse. However, it is folly to mistreat any tool simply because it is big. Our national crisis has made all tool replacement difficult, and there is every indication that this situation will get worse.

Efficient pneumatic tool operation depends upon three equally important factors: (1) The operator who uses the tool; (2) the man in the tool-room who services the tool; and (3) the engineer who installs air lines and operates air compressors.



Location of Air-line Lubricators and Air Strainers, and General Arrangement of Compressed-air Piping

Suggestions for the Operator

1. In starting work—and *before* attaching the tool—blow any moisture or loose dirt out of the air hose by turning on the air for a few seconds. At this time, squirt a couple of shots of light machine oil into the live-air handle.

2. Carry the tool from place to place instead of dragging it by the air hose. That will avoid bent trigger valves, marred housings, broken and chipped grinding wheels, broken drills, and bent drive-shafts.

3. Lay the tool down when not in use instead of dropping it. Dropping causes cracked housings, damaged handles and valves, and bent shafts. Make sure it will not be struck by heavy objects or pulled down by someone tripping over the hose. Keep the tool off the floor.

4. Do not use the tool as a hammer. Lay the tool down and use a proper instrument.

5. Clean the air strainer twice daily and do not punch holes in it. It keeps dirt and grit out of the tool.

6. Squirt a little light machine oil into the live-air handle every few hours, particularly when operating continuously.

7. Unscrew the tool from the hose when quitting at the end of the day. This helps to dry out the moisture. Turn in the tool for check-up every day.

8. If any parts of the housing work loose, tighten them at once or turn in the tool. Operating while loose causes misaligned internal parts and results in all sorts of damage.

The following five suggestions apply to pneumatic hammers:

9. Remove rivet-set spring clip by hand or tongs instead of knocking it off.

10. See that piston is perfectly square on both ends. Imperfect pistons damage both the barrel and the rivet set. *Do not alter length of piston.*

11. Make sure that rivet-set shank is of proper length and accurately square.

12. Remove rivet sets by hand. If shot out, both the piston and the rivet set are likely to be chipped.

13. All air ports and passages are of the correct size. Drilling them larger will cause trouble.

The following four suggestions apply to pneumatic drills and grinders:

14. Do not use twist drills with damaged shanks.

15. Be sure that grinding wheels are properly dressed and run true.

16. Keep all handles screwed in tight.

17. Use proper feed pressure, and hold the body of the tool steady. Never force a drill or grinder.

Suggestions for the Man in the Tool-Room Who Services the Tools

1. Every tool should be turned in at the end of a day's work.

2. Each tool that is turned in must be cleaned, inspected, and lubricated. Follow the maker's instructions for oiling and greasing.

3. Every tool, at least fortnightly, should be taken apart and thoroughly cleaned in a kerosene bath, inspected for wear, and lubricated.

4. New tools should be carefully checked daily for loose bolts or screws.

5. Tools with built-in oilers should have the reservoir filled daily. To lubricate tools not having this feature, an air-line lubricator should be installed in the branch main, near the air-hose connection.

6. Pneumatic hammers may be stored over night in a kerosene bath. They should be dried thoroughly and lubricated before being put into use again.

7. In greasing bearings and gears of rotary tools, the grease should not be packed tight. Allow some gear clearance to prevent drag and heating when at work.

8. Air hoses should be kept in good repair. Use fittings, connectors, and nipples having maximum air-passage openings. Small air passages can cause pressure drops, which always means power loss for the tool. Although there is but a difference of 1/16 inch between the inside diameters of 1/4- and 3/8-inch hose nipples, there is a difference of nearly 40 per cent in the air-passage area.

Suggestions for the Engineer Who Installs Air Lines and Operates Air Compressors

1. *Dirty Air*—This can be caused by not filtering the air at the intake of the compressor or by dirt and rust becoming loose in the air lines. In either case, foreign substances get into the tools and cause faulty performance and excessive wear. Small unit strainers should be placed in the branch main serving each tool. Locate the strainers as close to the hose end as possible, but *behind* the line lubricator.

2. *Wet Air*—Moisture flushes out lubricants, brings about corrosion, and causes loss of power in freezing weather. It can be avoided. A properly designed aftercooler at the compressor will remove most of the moisture. Compressed air should enter the air receiver near the top and be withdrawn from a point near the bottom. Blow water out of the air receiver frequently. Pitch air mains in the direction of the air flow. Down pipes at branch mains should be taken off at the top of the main and a long-radius return bend should be used. Install a water leg at the lower end of each branch main *below* the hose take-off. Empty water legs and separators at frequent intervals.

3. *Low Pressure*—Pneumatic tools are frequently condemned when the only trouble is insufficient air. Efficient tool operation requires 90 pounds air pressure *at the tool.* Tests should be made while tool is operating under full load. The pressure drop should be about proportional to the rate of air flow. Air lines, valves, and hose connections should be large enough to allow the maximum amount of air required to pass; otherwise, excessive pressure loss occurs under full-load demand. Under-size hose fittings can cause a pressure drop, which results in a direct power loss by the tool.

Milling Machine Attachment for Threading Short Plugs

A comparatively simple milling machine attachment designed for the rapid threading of large quantities of small brass plugs, such as shown in Fig. 3, is illustrated in Figs. 1 and 2. The brass plugs are made from stampings and are difficult to hold by the head without distorting them to such an extent that they will not meet the close dimensional requirements specified. Since the thread length of only 0.360 inch made it impractical to use a die-head, the special thread-milling attachment was devised for use on a universal milling machine.

The function of the attachment is to rotate and axially traverse the plug so that the thread will be cut at *F* by the rotating cutter *E* mounted on the arbor of the milling machine. The main spindle *A* of the attachment is mounted in a long bearing in housing *B*, and is threaded at the right-hand end to receive the adapter or work-holder *C*. The left-hand end of spindle *A* is reduced in diameter to take sleeve *D*, which is fastened to the spindle. Sleeve *D* is threaded to fit bushing *L*. This thread has the same lead as the thread to be milled. Spindle *A* is operated by a handle placed on the squared end.

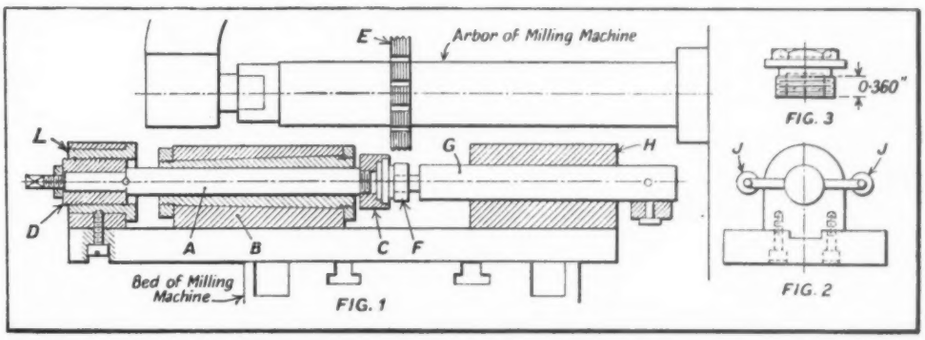
The work is held securely in the chuck, and backlash is eliminated by a spring-loaded plunger *G*, which is a sliding fit in bushing *H*. Two springs *J*, each exerting a load of about 75 pounds, are attached to the plunger at one end and to the housing at the other end. A simple lever arrangement (not shown) is provided for withdrawing the plunger to permit inserting and removing the work.

The attachment is set up so that the angle between the spindle of the attachment and the arbor of the milling machine is equal to the helix angle of the thread. In setting up the attachment, care should be taken to have the shoulder on the work just clear cutter *E*. The work is fed vertically to the cutter. When the first cut has reached its proper depth, a handle is placed on the squared end of spindle *A* and turned to give the work the required combination of longitudinal feed and rotation necessary to cut a thread at *F* of the desired pitch.

On completing one full turn, the handle is brought back to the starting point and a finishing cut taken in a similar manner. The finishing cut removes 0.005 to 0.010 inch of stock. Over 2000 plugs have been satisfactorily threaded by this method, each threading operation requiring from two to three minutes. B. M.

Figs. 1 and 2. Attachment Used on Universal Milling Machine for Milling Thread on Plug Shown in Fig. 3

Fig. 3. Brass Plug that is Threaded by Attachment Shown in Figs. 1 and 2



Gaging Set-Ups of the Fixture Type

By F. SERVER

The two fixture type gages shown in Figs. 1 and 2 are of interesting and unusual design, although they differ entirely in purpose and in approach to the gaging problems. The gage shown in Fig. 1 is of the dial indicator style, while the one shown in Fig. 2 is of the slide step-pin type. Each of the gages is provided with built-in means for holding the work.

The function of the gage shown in Fig. 1 is to check the central location or alignment of the two milled lugs *a* and *b* relative to the ground stem diameters at *C* and *D* of the piece shown by dot-and-dash lines at *X*. The alignment reading is taken with the vee *E* of a locating block pressed tightly against the work in the position shown.

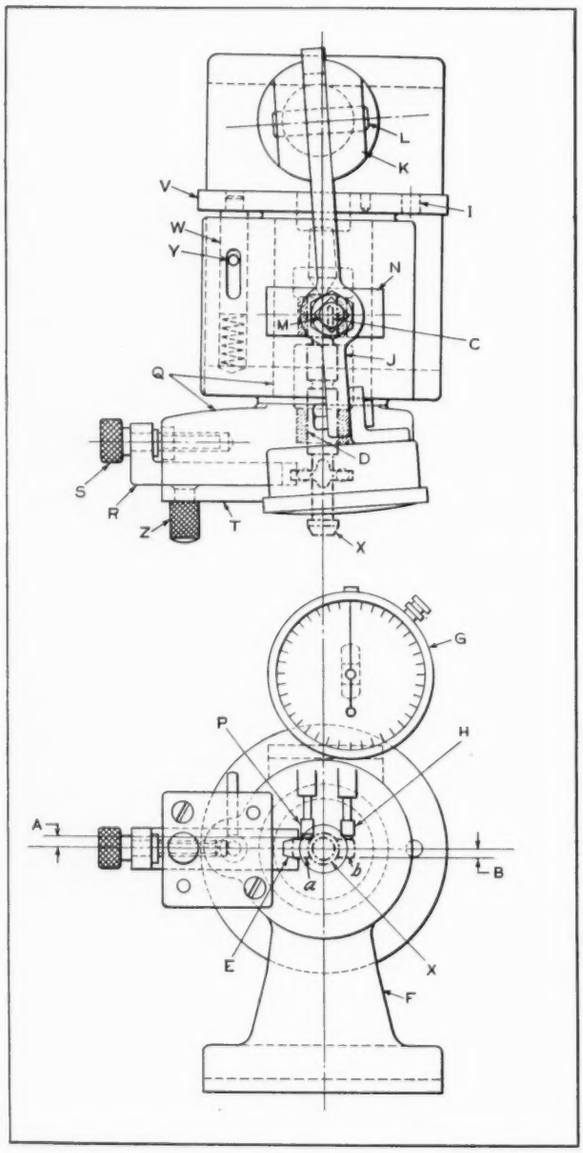


Fig. 1. Fixture Type Gage Designed for Checking Central Location of Lugs a and b

The gaging equipment and work are mounted on the base indicated at *F*. The dial gage at *G* is shown with its measuring point *H* in contact with the work. This dial indicator is mounted on arm *J* which is pivotally attached to a swivel stem at *K* by means of a hinge pin *L*. An important part of the arm is the adjusting screw *M*. This screw is set so that it rests on a hardened steel block *N*, screw *M* being adjusted to bring the indicator point to zero for a mean reading of distance *A* or *B* from the center. The object in having arm *J* swivel is to permit gaging point *H* to be set at either the position shown or at *P*, as desired, while screw *M* rests on block *N* in both positions. This is accomplished by simply raising the arm and moving it to the other position by hand.

The work *X* is located in bushings at *C* and *D* in the stem of head *Q*, which contains an adjustable slide *R* having a V-notch *E* at its end and an adjusting screw *S* by means of which it can be moved in and out. Slide *R* is held in place by plate *T*. At the other end of the head is an indexing plate *V*, which is securely held in place.

There is a spring pin at *W* which is free to enter the indexing hole, as shown, or a second hole *I* at an angle of 180 degrees from the one in which pin *W* is shown. A small extension pin at *Y* is provided for moving the spring pin, while a knob at *Z* facilitates revolving the index-head.

Work *X* is placed in the fixture with one lug located by the vee at *E* in the central position, after which the operator takes a reading of dial gage *G* with the anvil at *H*, and another reading with the anvil at *P* by swinging gage *G* from one position to the other. These readings must be within the allowable limits if the work is to pass inspection.

Next, indexing pin *W* is withdrawn by pulling back on pin *Y* to release index-plate *V*, so that it can be indexed 180 degrees to permit pin *W* to enter indexing hole *I*. While revolving or indexing the head, the indicator is swung clear of the work. Two more readings are then taken at positions *H* and *P* in the second setting. This method serves to check the width of the two lugs, as well as their alignment with the stem or bearings located in bushings *C* and *D*.

Inspection of the irregular-shaped part shown at *X*, Fig. 2, is accomplished by placing it on block *C* over two locating pins *A* and *B*. Plate *D* forms the base of the gage, on which four gaging units are mounted. These units have stepped slides—*E*, *F*, *G*, and *H*—each having a "Go" surface and a "No Go" surface at their ends. The slides are mounted in blocks *J*, *K*,

L, and *M*, which have retaining plates that hold them in place and which are attached by screws and dowels to base *D*. Pins *P*, *Q*, *R*, and *S* are provided to operate the gaging slides. These pins travel through elongated slots and are used to move the slides by hand when inspecting the work.

In using this gage, the "Go" end of slide-block *E* slips between the forks of the work, and is prevented from further inward movement when it reaches the "No Go" size if the work is of the correct size. However, the slide is shown in the illustration with the "No Go" size entering the work between the forks, which indicates that this dimension is over size.

Slide *F* is employed to inspect the depth of the radius-cut vee at one edge while slide *H* checks point *W* at the other end of the cut. The purpose of slide *G* is to check the position of the radius slot relative to the sides of the work. This makes it necessary to have the "Go" and "No Go" limits on the same sides of slide *G* as on slide *E*.

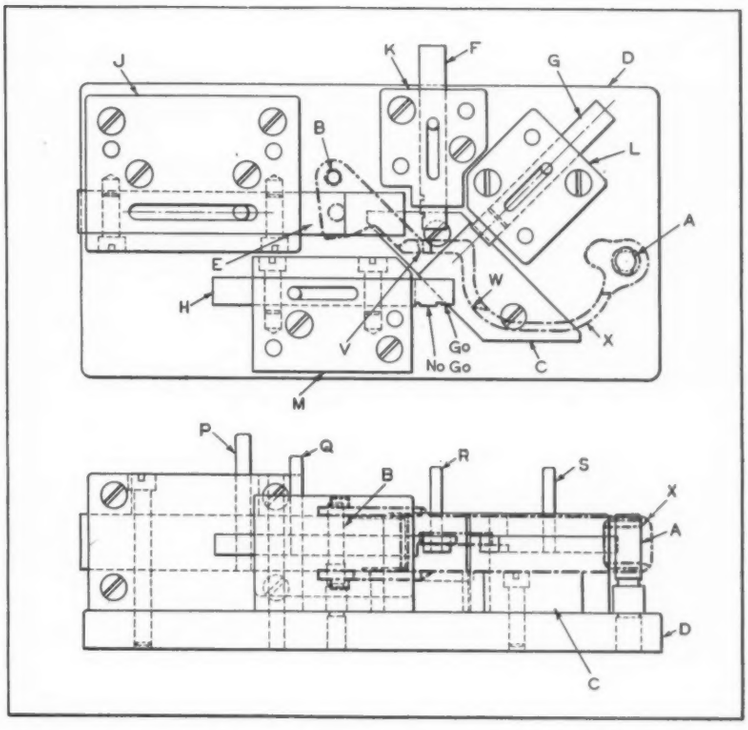


Fig. 2. Stepped "Go" and "No Go" Slide Type Gage for Checking Fork Width and Position and Size of Slots in Work X

It is a very simple matter to inspect work with gages of this type, as it is only necessary for the inspector to place the work on the locating pins, move the slides by means of the operating pins, and note whether or not the "Go" portion enters the work and whether the "No Go" portion is prevented from entering.

* * *

Simpler Machine Tools Advocated by Prominent English Manufacturer

In a letter to the British publication MACHINERY, Sir Alfred Herbert, one of the most prominent men in the machine tool industry in Great Britain, advocates a return to simpler machine tools for purposes where highly developed universal machines are not required. "Far too much time, labor, and material, to say nothing of money, are being wasted in building universal milling machines, universal grinders, and elaborate universal lathes in numbers which cannot be justified," says this British manufacturer. "Some universal machines are, of course, essential; but much of the work which is done on these machines can be done better and more quickly on plain machines. . . .

"Elaborate and costly accessories for milling machines are also being specified to an extent which is definitely unnecessary, including, for example, universal and high-speed vertical attachments, differential indexing devices and the like, most of which, though perhaps useful on two or more machines in a factory, generally spend a greater part of their time under a bench or in a store-room.

"Besides having to build far too great a proportion of elaborate machines, we are now confronted with an amazing increase in the demand for attachments. . . .

"An immense amount of time would be saved if careful investigations were made beforehand and only those attachments absolutely vital to the work to be done were ordered. Machine tool builders would thereby be able very substantially to increase their output of machines."

One leading American machine tool builder, having read the letter published in British MACHINERY, makes the statement that "this letter might well be published in the United States, because American machine tool builders are receiving the same type of demands for elaborate machines and attachments. Such demands hamper the production of the machine tool manufacturer, and should be eliminated in these critical times, except where such demands are definitely warranted."

* * *

The war will change many preconceived ideas in engineering and shop practice, just as it has in military and naval strategy.

The Douglas Blackout Plant

Approved for Publication by the War Department

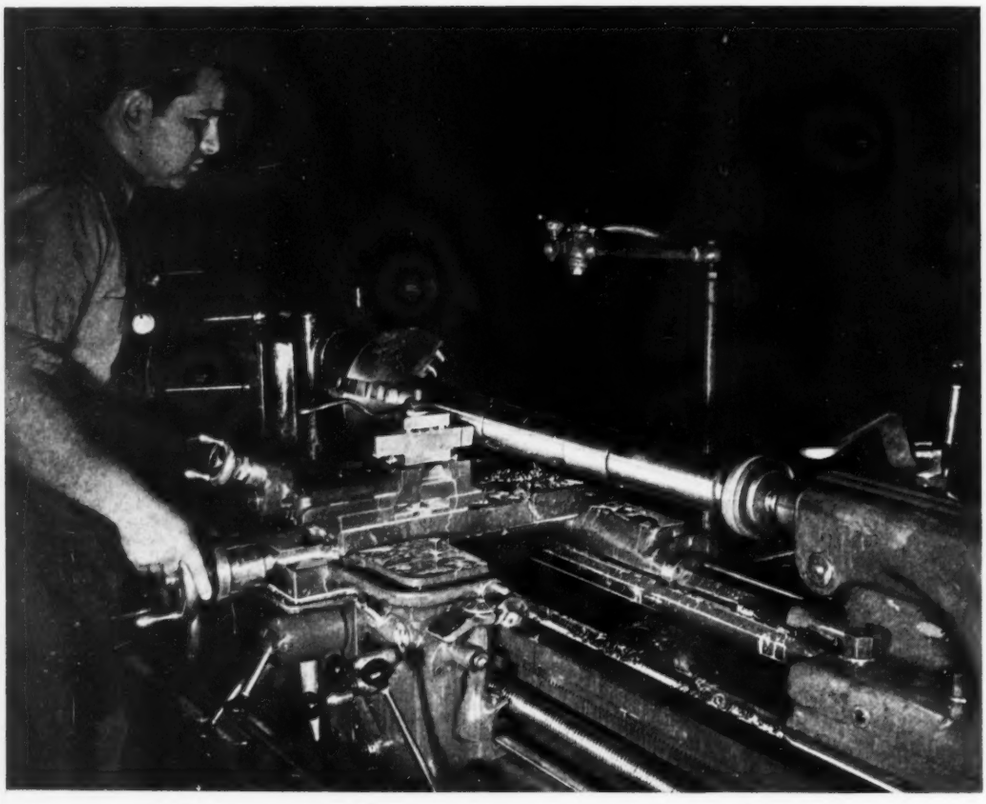
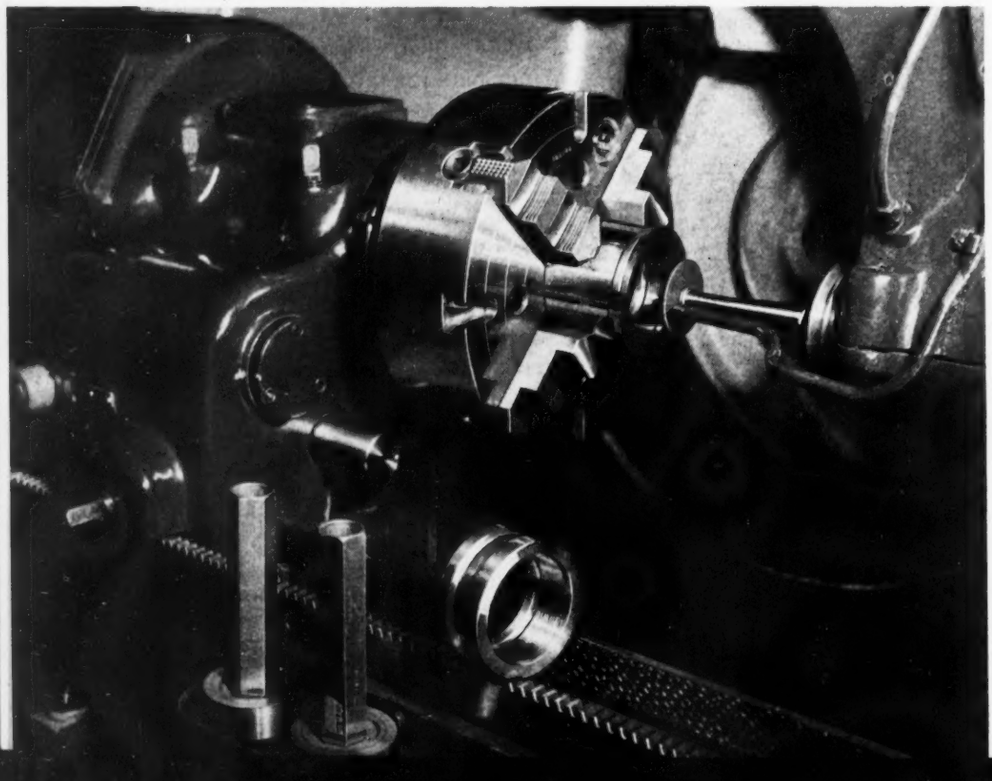


Fig. 16. Rough- and Finish-turning a Main Landing-gear Axle Having a Hardness of 40 Rockwell C with Carboloy-tipped Cutters

Fig. 17. A Typical Thread-grinding Operation Consists of Grinding an Internal Thread in Landing-gear Wheel Bearings



PRODUCTION methods in the new California blackout plant of the Douglas Aircraft Co., Inc., are considered representative of the best practice in airplane-building industry. A considerable number of the outstanding operations were described in the first installment of this article, which was published in July MACHINERY. Additional operations will be described in this, the concluding, installment.

A typical lathe operation on landing-gear parts is shown in Fig. 16. This illustration shows an American lathe engaged in rough- and finish-turning a main landing-gear axle of SAE 4130 chromium-molybdenum steel tubing after it has been heat-treated to have a tensile strength of from 180,000 to 200,000 pounds per square inch and a hardness of 40 Rockwell C. Carboloy-tipped cutters are employed.

A typical operation on a Jones & Lamson thread-grinding machine is shown in Fig. 17. This consists of grinding an internal thread, 3 inches diameter, 16 threads per inch, in a landing-gear wheel bearing. The thread is ground from the solid. Gages such as seen at the front of the machine are used to insure that the pitch diameter is between 2.9594 and 2.9641 inches. The thread must be ground to a Class 3 fit.

Bakewell precision tapping machines are used for a considerable range of work, a machine of this type being shown in Fig. 18 in use on duralumin forged

Builds for Victory

By RAY A. STEINBAUER
Superintendent of Machinery and Parts Production
at One of the Plants of Douglas Aircraft Co., Inc.

gasoline-tank fittings. Three pipe threads of 1/4, 3/8, and 3/4 inch are tapped in the taper-reamed holes to a Class 3 fit.

The application of an Oilgear broaching machine to an important assembling operation is seen in Fig. 19. This operation consists of forcing two lug brackets over one end of a tail-wheel spindle and a third fitting into the opposite end of the spindle. The two lug brackets are seated in a fixture attached to the faceplate of the machine, while the third fitting is mounted on a slide seen at the left, which is actuated by the regular hydraulic system of the machine. In operation, this slide is pulled to the right so as to push the fitting into the tail-wheel spindle, and the other end of the spindle through the two lug brackets. Correct radial positioning of the lug brackets is insured by inserting dowel-pins through blocks on the holding fixture and machined holes in the brackets. A pressure of approximately 15 tons is applied for assembling the parts.

Before the engine-mount rings milled in the operation shown in Fig. 8 (July MACHINERY, page 172) go into the machine shop, they must be bent so closely to the required shape that eight points around the forging will contact with gaging points on an inspection fixture. The bending is done on a Hannifin 100-ton hydraulic press in the manner illustrated in Fig. 20.

Twenty-four terminal

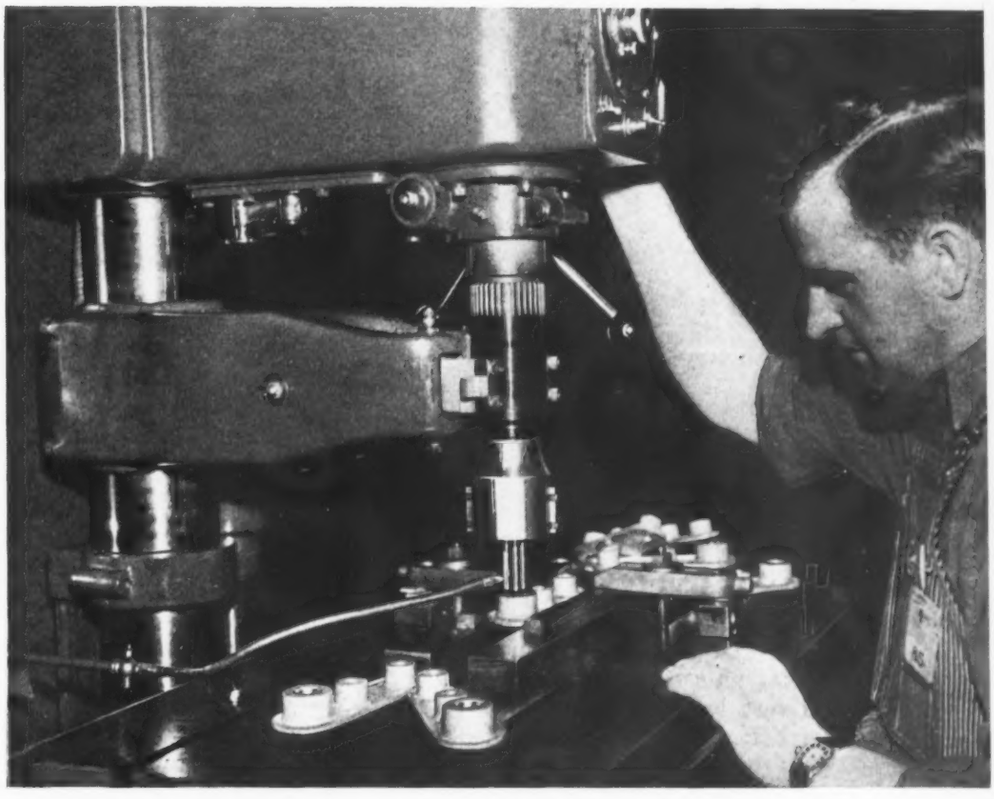
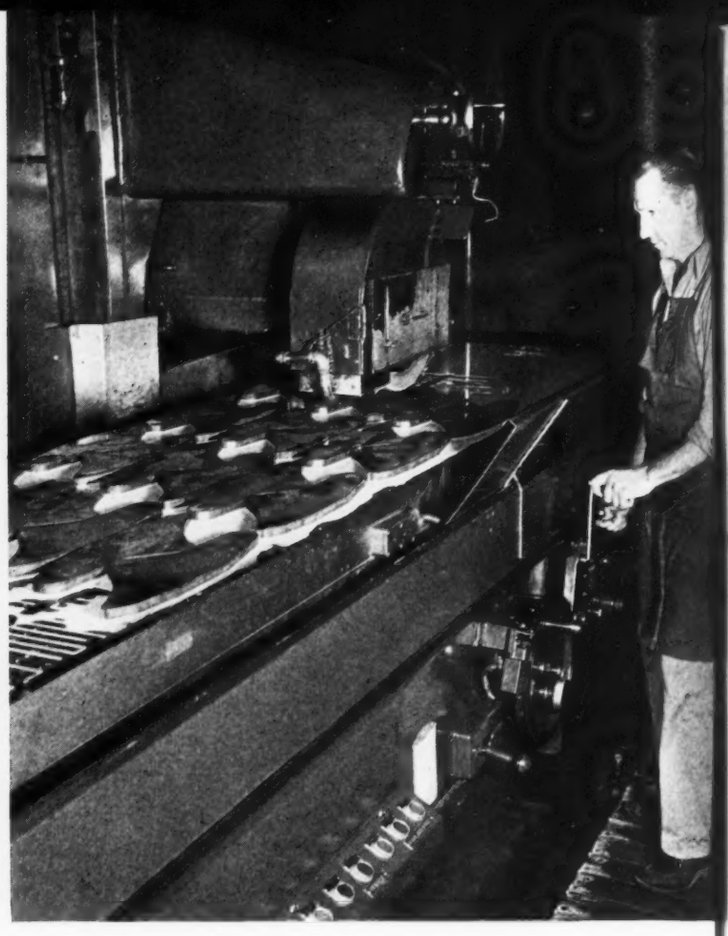


Fig. 18. Employing a Precision Tapping Machine for Producing Pipe Threads in Gasoline-tank Fittings to a Class 3 Fit

Fig. 19. Applying a Hydraulic Broaching Machine for Assembling Two Lug Brackets and a Fitting to Tail-wheel Spindles



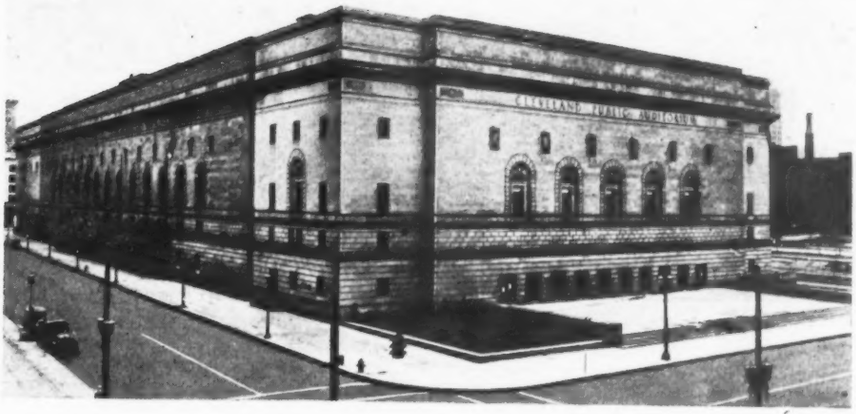
plates are being ground at one time by the Thompson hydraulically actuated grinding machine shown in Fig. 21, which is equipped with a magnetic chuck measuring 30 inches wide by 10 feet long. The terminal plates are ground on both sides to the specified thickness within plus nothing, minus 0.0005 inch. The grinding wheel used on this operation is 20 inches in diameter by 6 inches in width.

Sometimes operations can be speeded up by providing means that facilitate the movements of machine operators. An example is found in the gang drilling machines shown in Fig. 22, of which there is a large battery in this shop. The operators of these machines are provided with seats that roll freely on an angle-iron structure at the front of each machine. This enables the operators to move sideways without effort when transferring work from spindle to spindle of the machine in the performance of successive operations on the same part. The illustration shows six-spindle gang drilling machines which are used for a variety of operations on links, shutters, and other cowling accessories.

Fig. 20. (Upper Left) Employing a 100-ton Hydraulic Press for Bending the Split Halves of Forged Engine-mount Rings to Pass a Rigid Inspection

Fig. 21. (Upper Right) Terminal Plates Cut out by Oxyacetylene Torches are Finished on the Sides by Surface Grinding, the Edges being Left "As Cut"

Fig. 22. (Left) Gang Drilling Machines are Equipped with Sliding Seats to Facilitate the Movements of the Operators



The Twenty-Fourth Annual National Metal Exposition

CLEVELAND, OCTOBER 12-15

OVER 250 manufacturers in numerous branches of the metal industries have signified their intention of exhibiting at the twenty-fourth annual National Metal Exposition to be held in the Public Auditorium and Exhibition Hall at Cleveland, Ohio, October 12 to 15. The exposition this year has been properly named the "War Production Edition" of the National Metal Exposition. It will be held in conjunction with the National Metal Congress, in which participate the American Society for Metals, the Wire Association, the American Welding Society, and the Iron and Steel and the Metals Divisions of the American Institute of Mining and Metallurgical Engineers.

The exhibits are intended to show thousands of manufacturers and engineers engaged in war production the most recent developments in materials, processes, and equipment that will speed the manufacture of war materials.

Many of the exhibits will be of special value to engineers who have found that, in the present emergency, they must specify and use materials different from those they have employed in the past and with which, therefore, they are not entirely familiar. It is the object of both the management of the Exposition and of the exhibitors to provide these men with an unusual opportunity to become acquainted with new and substitute materials, and with new processes of importance in the war industries.

At the technical meetings held by the societies mentioned, a very large number of papers will be read, covering almost every phase of the treatment and use of metals. The American Society for Metals alone has scheduled nearly 100 papers, and the American Welding Society upward of 60 papers and reports.

One of the features of the program of the Society for Metals will be a five-day lecture series, to start at 5 P.M. each afternoon. This series will deal with various phases of the treatment and application of tool steels, and will be conducted by James P. Gill, chief metallurgist of the Vanadium-Alloys Steel Co.

Besides the regular technical sessions of the four participating societies, the Metal Congress will have additional meetings on substitute materials, salvage, employe training, maintenance, and other timely topics fitting into the theme of the entire meeting, which is "Increased Production of War Products." Government and War Production Board officials are expected to attend the meeting and participate in the various sessions.

These special war production sessions are patterned after similar meetings held in connection with the Metal Congress last year. Among the topics to be discussed may be mentioned: Fabrication of Aluminum Sheet; Segregation, Collection, and Reclamation of Scrap; Deep Drawing Problems in Brass and Steel; Manufacture and Heat-treatment of Magnesium Castings; Better and Faster Production Hardening; Speeding Production by Improved Metal-cutting Practice; Magnaflux and Other Surface Inspection Tests; Radiographic Inspection; Powder Metallurgy; Training and Handling Inspectors; Application of Low-tin Alloys; Salvage of Broken Tools; and Maintenance of Equipment.

Condensed Review of Some Recently Developed Materials

Arranged Alphabetically by Trade Names

Class of Material	Trade Name	Properties	Applications
Welding Glass	**Alubro-Weld**	A blue glass compounded to filter out injurious rays of light. Has higher visible light transmission than ordinary blue glass; blocks out ultra-violet rays entirely; greatly reduces transmission of infra-red rays.	Specifically recommended for aluminum and bronze welding, glass work, instrument making, and other operations where sodium yellow glare is encountered.
Protective Coating for Repairing Tin Surfaces	**Amco Metallic Coating Powder, Brand K**	A compound with a melting point lower than that of tin. It blends readily with tin coatings and is electro-positive to iron and steel, affording protection against rust and corrosion.	Can be used wherever tin coating has been damaged or worn away. Suitable for use on food container surfaces that do not come in direct contact with food.
Protective Coating	**Amercoat**	A liquid plastic coating for brushing or spraying on metal or concrete surfaces. It is odorless, tasteless, and chemically inert. Will not check, crack, or fracture when subjected to vibration, and also resists abrasion. Usually applied in three coats.	Suitable for use where resistance to salt water, cold mineral acids, alkalies, oils, fats, gasoline, mineral salts, and alcohol is required. Not suitable for use when subjected to certain acids in concentrated form, aldehydes, benzine, carbon disulphide, and ether.
Malleable Iron	**Belectromal**	A malleable iron which has high strength without sacrificing the ductility and machinability usually associated with this type of iron.	Intended for parts requiring greater strength than ordinary malleable iron, but having comparable ability to withstand shock and to machine readily.
High-temperature Lubricant	**Caloria**	A high-temperature lubricant that gradually vaporizes when used, and leaves no residue. Also available with small amounts of colloidal graphite added.	For use wherever difficulties are experienced with high-temperature lubrication, due to deposits of carbon and "varnish" remaining after evaporation of the lubricant.
Blackout Coating	**Carbozite Blackout Black**	A non-reflective, completely opaque blackout compound which adheres firmly to glass, is impermeable to moisture, and is unaffected by smoke, soot, extreme heat and cold, or sunlight.	Applied to exterior surface of windows by brushing or spraying. Is readily removed with gasoline, kerosene, or any light petroleum solvent.
Bearing Material	**Carobronze**	A bearing material having ability to carry heavy loads at high speeds. Contains 91.2 per cent copper; 8.5 per cent tin; and 0.3 per cent phosphorus.	It is available in tubular form, wire, rods, and bars, and sheet and strip. Shorter, thinner-walled bushings are made possible by this material.
Magnesium Fire Extinguisher	**Cend-Ex**	A granulated coal-tar pitch conforming to standards set by U. S. Bureau of Mines.	For use in extinguishing magnesium fires or incendiary bombs.
Protective Coating	**Chempruf**	Protective coating designed to withstand attack by any acid or alkali at temperatures below 300 degrees F. Available in liquid form for brush application and as a plastic for heavy-duty service. Compound starts to soften at 300 degrees F. and melts at 510 degrees F. Not recommended for contact with mineral solvents, oils, and greases.	Average of four coats required for protection. Useful in the protection of plating and acid tanks, fume ducts, storage and processing tanks, and other surfaces, including ceramics exposed to destructive agents.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Armour Plate	**Colalloy Armorplate**	This armor plate weighs 50 per cent less than steel, and has a much greater surface hardness than ordinary armor plate. Its highly polished surface resists corrosion.	Designed for use in the construction of propellers, wings, fuselages, struts, gas tanks, and other parts for military airplanes.
Hard-surfacing Alloy	**Colmonoy No. 4**	A hard-surfacing alloy that has a hardness of 35 to 40 Rockwell C and can be machined without great difficulty. It is applicable to cast iron.	Suitable for application to forming and drawing dies and parts subjected to abrasion.
Hard-surfacing Alloy	**Colmonoy No. 5**	A hard-surfacing alloy that has a hardness of 45 to 50 Rockwell C and provides good wear resistance and freedom from galling, combined with moderate machinability.	Suitable for high-temperature steam valve trim and solid shaft bearing surfaces.
Hard-surfacing Alloy	**Colmonoy No. 6**	A hard-surfacing alloy that has a hardness of 55 to 60 Rockwell C, with high abrasion resistance and high compression strength.	Used extensively on parts having very small wear tolerances, and in cases where heavy pressures are encountered.
Galvanized Sheet	**Colorbond**	A galvanized sheet with a special surface finish which is more resistant to rust and provides a better bond for paints, lacquers, varnishes, etc., than the usual finish.	Available in three types of base metal: Steel, copper-steel, and pure iron-copper alloy, in a full range of sizes and gages.
Packing Material	**Corroflex**	A waterproof packing material consisting of a flexible, corrugated packing with criss-cross indentations, together with a duplex asphalt-lined sheet.	Useful in protecting metal parts and products against rain, hail, snow, or moisture.
Plating of Steel	**Corronizing**	An electrolytic process for applying alternate layers of nickel and tin to steel sheets.	Suitable wherever tin plating alone has been required. Effects considerable saving in tin.
Rifling Oil	**Cut-Max**	An oil of unusually light body which flows freely through small orifices; is said to be especially suitable for high-production operations.	For use in hydraulically operated rifling machines.
Babbitt Substitute	**Defender**	A lead-base bearing metal suitable for use in place of tin-base babbitt.	Recommended where bearings are subject to shock, as in internal combustion engines, trap-rock crushers, and sifter machinery.
Lubricant for Drawing and Stamping Nickel Alloys	**Diglycol Stearate S**	A white wax-like solid, dispersible in water. Melts at 51 to 54 degrees C. Fires off at any annealing temperature (above 400 degrees F.) in an atmosphere of oxygen or hydrogen.	One per cent solution used for drawing, stamping, and forming nickel alloys. Smaller concentrations used as coolant in stamping operations.
Penetrating Agent	**Dresinate**	A finely divided, uniform powder that greatly increases the detergency of alkaline cleaning solutions. The emulsifying action helps to get oily foreign material into suspension for removal.	Suggested for use in conjunction with trisodium phosphate, sodium metasilicate, caustic soda, soda ash, borax, and other alkaline detergents for cleaning metal prior to rust-proofing, lacquering, painting, or plating.
Magnesium Fire Extinguisher	**duMag**	Dry fire-extinguishing powder for extinguishing magnesium and incendiary bomb fires.	Powder is applied directly to burning magnesium from container or with scoop, shovel or other mechanical means.
Luminous Paint	**Durad Luminous Paint**	A paint that reradiates light for twenty hours after exposure to daylight or electric light for a few minutes. Produces a flat white finish or glossy finish with special top coat. Contains no toxic materials.	May be used indoors with special primer and thinner supplied. A special clear top coat is used for outdoor applications.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Powdered Iron	**Durex**	Easily formed into complex parts without machining operations. Graphite content provides certain amount of self-lubrication. Has relatively high hardness and resistance to wear, as well as tensile and compressive strengths equivalent to cast and malleable irons.	Has found application in gears requiring accurately formed tooth profiles, guide blocks for machine saws, textile machine bearings where corrosion prevents the use of copper alloys, and cams.
Phenolic Molding Compound	**Durez 775**	A general-purpose phenolic molding compound with excellent molding characteristics and a fast cure; will provide a smoother and more lustrous finish than the average general-purpose material.	As compared with other general-purpose compounds, it has lower water absorption, slightly higher flexural and tensile strength, and a heat resistance of 400 degrees F.
Phenolic Molding Compound	**Durez 1910**	Third in a series of high-impact phenolic molding compounds. It preforms easily, and flows readily through standard feeders, as particle size is comparable to dry rice. Has a specific gravity of 1.45 and a bulk factor of 3.6 to 1.	Developed especially for such applications as bumper shoes, refrigerator lock-bolts, and other parts where minimum frictional resistance is desirable.
Phenolic Plastic Impregnant	**Durez 7347A**	A phenolic resin applicable to porous castings. Impregnation is accomplished under air pressure and is followed by baking with or without steam pressure. A smooth surface is formed that is practically impervious to water, solvents, mild alkalies, and acids.	For impregnation of porous castings that do not quite hold required pressure or where a smooth impervious surface is required.
Phenolic Molding Compound	**Durez 11540**	Phenolic molding compound with high impact strength and surface finish with a durable luster.	For general-purpose uses.
Phenolic Molding Compound	**Durez 11863**	Phenolic molding compound having very low power factor (0.07 at 1000 K. C.) and high dielectric breakdown and fatigue strength. Has excellent compression moldability.	Especially developed for radio parts, such as condensers, crystal-holders, etc.
Phenolic Molding Compound	**Durez 11934**	Macerated fabric-filled phenolic molding compound with good curing time.	Used for general purposes where relatively high impact strength is required.
Blackening Process	**Ebonol C**	Process that forms jet-black coating of cupric oxide, which will not chip or flake off. Coating can be buffed, and does not require lacquering to prevent wear. Can be heated to almost dull red heat without flaking.	Suitable for blackening copper, beryllium copper, bronze, phosphor bronze, and brasses with zinc content of 35 per cent or less.
Blackening Process for Zinc	**Ebonol Z**	An immersion process for blackening zinc and its alloys. Immersion in a solution of the salts at 150 to 212 degrees F. results in a jet-black inorganic finish in from one to five minutes. Also can be used to produce black coatings on stainless steel, nickel silver, nickel, and the noble metals.	Can be utilized for blackening zinc-plated or hot-galvanized surfaces, as well as solid zinc and its alloys. Also applicable to nameplate finishing and blackening of etchings on rules, squares, tools, etc.
Steel	**Elastuf 44**	Unusually uniform cross-sectional hardness of about 44 Rockwell C. Tensile strength, 200,000 pounds per square inch; elongation in 2 inches, 13 per cent. A smooth high luster is readily obtained in turning, threading, milling, or gear-cutting operations. Not suitable for welding.	Suitable for gears, worms, pinions, bull riveter dies, injection molding machine parts, compression dies and blocks, gudgeons, journals or short shafts, especially those on which roller bearings run without an inner race, and high-speed shafts or axles subject to great torsional impact.
Metal-blackening Process	**Electro-Ebonol**	A process for the electrolytic blackening of almost all metals. Deposits are made in from 30 seconds to 3 minutes at 140 to 190 degrees F.	Aluminum, steel, stainless steel, zinc, cadmium, nickel, silver, gold, lead, tin, and various alloys can be blackened.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Metal Finish	**Electro-Jetal**	A black rustproof finish that provides an absorbtive base for subsequent treatment with oil, wax, or lacquer.	Applicable to any metal surface that can be copper-plated.
Spring Wire	**Electromatic**	An oil-tempered spring wire of uniform physical properties and closely controlled fatigue values.	Suitable for a wide range of uses, such as brake springs, clutch springs, airplane construction, farm machinery springs, etc.
Penetrating Rust Solvent	**Exola**	A compound that combines chemically with rust or corroded metal to form a metal stearate similar to grease.	For freeing metal parts that have rusted or corroded together.
Tinning Flux	**Fas-Tin-Flux**	A concentrated liquid tinning flux of the zinc-chloride type. Has special addition agents to assure fast action, and is free from uncombined hydrochloric acid. Can be poured on molten tin without danger of explosion.	For use in hot-tinning, in the manufacture of terne plate (lead - tin alloy), and for soldering.
Protective Coating	**Flexo Wax C and Diglycol Stearate S**	An emulsion of these two products in combination with paraffin wax produces a water-repellent wax coating that protects metal.	For aluminum castings liable to attack by water condensation. Suitable on extruded parts and on zinc- and tin-plated products.
Brazing Flux	**Fluxined-Spelter**	A brazing flux that can be used in connection with furnace, torch, or spot-welding methods.	Suitable for joining carbide and all other types of cutting tips to tool shanks.
Aluminum Substitute	**Formula C-102**	Non-metallic material, one-third lighter than aluminum, made from fibrous and rubber-like ingredients. Resists ripping or shattering under gunfire, will not crystallize from vibration, and is free from corrosion and pin-hole formation.	Used in bullet-puncture sealing fuel tanks. Anticipated use to replace aluminum panels in bus and truck body construction.
Regalvanizing Process	**Gav-Weld**	Low-melting galvanizing material rubbed over bare spots formed at welded joints provides smooth wear-resistant and corrosion-resistant coating. Permits welded joint to be painted or enameled without danger of sweating.	Suitable for application in shipbuilding and contracting work; manufacture of tanks, cans, barrels, prefabricated steel houses, railroad cars, trucks, and other welded products.
Compound for Coating Glass	**Glasshield**	A transparent protective coating for glass, which does not interfere with vision or light transmission.	When applied to windows, it prevents shattering due to vibration from exploding bombs.
Tubing	**Gloweld**	An electrically welded stainless-steel tubing with high strength and corrosion resistance. Can be readily bent, coiled, swaged, and formed.	For hydraulic lines and structural and engine parts in aircraft construction.
Sweeping Compound	**Grease Ball**	A compound, containing no caustics or acids, for removing accumulations of grease and oil from floors.	In use, is sprinkled on deposit, scrubbed into grease or oil until deposit is soaked up, and then swept away.
Degreasing Agent	**Gunk X-11**	Available in the form of a concentrate that may be diluted with a grease solvent before using. Cleaning operation is carried out by cold immersion of greasy or dirty parts.	Suitable for use as a mineral grease and dirt-digestive solvent.
Tin Plating Process	**Halogen Tin Process**	Electrolytic process that is much faster than "alkaline" electro-tinning method. Sludging is eliminated. Tin deposited by this process can be heated without discoloration.	For plating strip steel. Useful in plating cans to save tin where thin coating is desired.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Ornamental Metal Finish	**Hammertone**	Finishes resembling hammered silver, copper, bronze, and other ornamental metals are obtained by this liquid finish. A base coat of desired color is followed by a spatter coat of Hammertone liquid.	Can be applied to any kind of metal, and also to molded plastics. The finish is tough and durable.
Self-lubricating Alloy	**Hancodur**	A self-lubricating alloy with excellent wearing qualities. Its tensile strength is 90,000 pounds per square inch.	Designed to be used for valve stems and bonnets.
Steel	**Hipersil**	A silicon steel of high permeability. Its flux-carrying capacity is one-third greater than that of ordinary silicon steel.	Particularly applicable to transformer core construction. Its use permits reductions in size and weight up to 25 per cent.
Alloy Cast Iron	**Hi-Tensilloy**	A chromium-molybdenum cast iron suitable for forming and drawing dies. Is readily flame-hardened with air-cooling. When flame-hardened (without a water quench), it has a surface hardness of 450 to 600 Brinell, with case depths up to 3/32 inch. When wear occurs, dies can be renewed by flame-annealing, machining, respotting, and hardening.	Used for automobile-fender draw dies and automobile radiator-grille dies. Useful where volume of production is large.
Zinc-plating Process	**Hubbell-Weisberg Process**	A method of electroplating steel products with zinc from relatively low-cost sources, such as galvanizers' skimmings, brass foundry fume, and organic reduction residues.	Process claimed to produce zinc-coated wire or strip equivalent to that produced by other plating methods. Commercially economical when 1½ to 2½ tons of zinc are utilized every twenty-four hours.
Steel Tubing	**Imperial Bundy**	A soft-temper steel tubing, copper-coated inside and outside, with additional tin coating on outside. Said to be stronger than copper tubing and to have greater resistance to vibration fatigue.	Can be used as a substitute for copper tubing and is suitable for gasoline and oil lines; machine tool hydraulic and lubrication lines; conduit tubing; connecting lines for oil-burners; vacuum lines; refrigeration condensers; etc.
Weld-Spatter Protective Compound	**Industrial Finish Flash-Off No. 99**	A compound that prevents adherence of weld spatter to parts being welded together. Also removes impurities from the weld and prevents pitting on galvanized or ungalvanized surfaces.	In use, the compound is wiped, brushed, or sprayed along surfaces adjacent to edges to be welded together. Grinding or scratching operations to remove spatter are eliminated.
Metal Coating	**Irco Zinc Coat**	Provides a rust-inhibiting base of zinc-phosphate. Applied by dipping metal, after cleaning, in processing solution for five minutes to one hour.	Used as a base for paint, enamel, or lacquer finishes, or may be used as a final finish.
Protective Coating	**Jetal**	This is an improvement of a former process. Two-bath system produces a deeper black coating with simpler manipulation and control of solution.	Provides a black corrosion- and rust-resistant finish to steel.
Machine Tool Finish	**Kem Machine Tool Enamel**	A faster drying synthetic enamel which provides greatly increased resistance to cutting compounds.	Intended specifically for machine tool castings.
Protective Coating	**Koroplate**	A grade of Koroseal paint for use under highly corrosive conditions. The base of this paint is a synthetic material developed from polyvinyl chloride. It can be brushed or sprayed at ordinary room temperatures. Available only in semi-glossy black.	Resists all acids except concentrated formic and acetic acids. Is not affected by brass-, chromium-, nickel-, cadmium-, zinc-, copper-, silver- or tin-plating solutions. Used for coating underground pipe lines and fume ducts in plating rooms.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Transparent Plastic Film	**Koroseal**	A synthetic thermoplastic material, processed into a transparent and highly durable film which is resistant to outside exposure, sun, oxygen, and extreme temperatures, as well as water. It is chemically inert and flame-resistant as well.	Used in laminated containers to hold acids and corrosives, and for insulating fine electric wire and cable. Also used in molded gaskets, grommets, and in acid and weather-resisting paints. Available in a variety of colors and also in translucent and opaque forms.
High-nickel Alloy	**KR Monel**	A high-strength, non-magnetic alloy having satisfactory machining characteristics combined with physical properties similar to K Monel. In hot-rolled form, it has a tensile strength of 90,000 to 120,000 pounds per square inch, with a hardness of 140 to 225 Brinell. In cold-drawn form, these values are higher.	Can be readily fabricated in automatic screw machines. Because of its non-magnetic property, it is particularly suitable in airplane construction. Has corrosion resistance similar to K Monel.
Labeling Material	**Kum-Kleen**	Material that adheres permanently and without moistening to any smooth surface, whether metal, glass, plastic, enamel, varnish, or wood.	Used as a substitute material for nameplates, metal tags, patent number plates, etc.
Metal Cleaner	**Lixol**	A metal cleaner of low viscosity, which forms a milk-white emulsion with water and dilutes clear with kerosene.	Suitable for pressure spray washing or for dipping or slushing to remove oil and grease coatings, particularly those containing abrasives or other solid dirt.
Fire Extinguisher	**Magout**	A non-absorbent, finely pulverized powder.	For smothering fires in magnesium shavings and magnesium incendiary bombs.
Steel Plate	**Manganal**	An austenitic, tough, non-magnetic steel containing 11 to 13 1/2 per cent manganese and 3 1/2 per cent nickel. Can be welded without subsequent quenching. Has a tensile strength of 140,000 to 150,000 pounds per square inch, an elongation in 2 inches of 72 1/2 per cent, and a reduction in area of 54 per cent.	Useful in electrical applications where non-magnetic characteristics are important. Also makes a good substitute for heavy castings where weight reduction is important, as in journal boxes, wear plates, mill liners, shovel buckets, crusher hammers, etc.
Metal Coating	**Marlox**	A plastic coating for metals that has a high degree of adhesion and is not appreciably affected by temperature changes. Can be applied by spraying, dipping, or brushing.	Used as a priming coat or alone, to protect metals against rust and corrosion. Particularly suitable as a coating for welds to prevent corrosion in seams and folds.
Photographic Material	**Matte Transfer Film**	A photographic material for sensitizing metal plates for the photographic printing of drawings by contact or projection.	Applicable in any field where metal templets are used in laying out operations.
Pattern Coating Compound	**Metaline**	Liquid metal compound designed to coat and seal wax fillets and gates preparatory to the use of "Patternseal." Reduces the usual hand-soldering by about 50 per cent when used as a bond between metal plates.	Can be applied as a heavy coating over small pin-holes in metal patterns or around edges for thin fillets; also as a bond between two surfaces, such as between metal hand patterns and metal or wooden plates.
Stripping Compound	**Metastrip**	A stripping compound, furnished in concentrated liquid form, which removes finished coatings by emulsifying action, leaving a clean metal surface. Contains no caustics.	Useful in stripping baked enamels, varnishes, lacquers, paints, japans, and new synthetic finishes from various metals.
Anti-Rust Oil	**Miccroil**	This oil contains 42.5 per cent total solids, and has a consistency that provides a uniform protective film. Is applied by hand-dipping, and removed with a solvent.	For protection of metal surfaces subject to corrosion.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Coating Material	**Miccrolac**	A transparent coating material that dries rapidly to a high luster and has excellent adhesion, flexibility, and abrasion resistance. Can be applied by spraying, dipping, or brushing.	Provides excellent protection against the harmful action of sulphur dioxide, sunlight, moisture, oil, grease, gasoline, and chemical fumes.
Stop-off Lacquer	**Miccro-Supreme**	An easily applied lacquer that eliminates the handling and grinding operations ordinarily required before heat-treating to remove copper-plating on areas to be hardened.	Used in connection with localized hardening of steel parts. Prevents copper-plating from adhering to areas to be hardened.
Bearing Material	**Monarch Metal**	A bearing bronze manufactured in various high-lead combinations. Does not contain hard, abrasive tin and lead oxides. Superior hardness and compression resistance are provided. In cases of lubrication failure, seizing or galling of shafts is avoided.	Adapted to a wide range of bearing and seal applications. Less friction, heat, and noise are claimed to be produced by this material.
Aluminum Alloy	**No. 40**	This is a high-strength aluminum alloy, with a tensile strength of 35,000 to 40,000 pounds per square inch, a Brinell hardness (500 kg.) of 80 to 90, and a modulus of elasticity of 10,700,000.	For structural and decorative uses. Will take a high polish and has good resistance to corrosion.
Aluminum Alloy	**No. 40-E**	This is an aluminum alloy of high ductility. It has a tensile strength of 32,000 to 36,000 pounds per square inch, a Brinell hardness (500 kg.) of 70 to 80, and a modulus of elasticity of 9,020,000.	For structural and decorative uses. Will take a high polish and has good resistance to corrosion.
Tool Steel	**No. 773**	A medium-carbon manganese-molybdenum steel possessing a high degree of toughness.	Suitable for dies, punches, cutting tools and chisels, step-down dies, etc.
Blackout Paint	**P-40**	A blackout paint that dries in thirty to forty minutes to a self-leveling, dull, flat surface.	Suitable for outdoor applications. Unaffected by exposure to sunlight, rain, sleet, snow or exhaust steam.
Protective Coating	**Paratex**	A fast-drying, waterproof covering material made from chlorinated rubber. Unusually resistant to ordinary solvents, such as gasoline, kerosene, and lubricating oil, and also to alkalies, soda ash, and inorganic salts in dust or powder form.	Especially suitable for protecting steel work exposed to salt air. The metal primer also used has a lateral absorption action which turns up loose scale that might form subsequent defects in the covering.
Pattern Coating Compound	**Patternseal**	A coating that forms a protective seal against moisture penetration. It permits patterns to be used without a parting compound. One application usually lasts for a full day's run.	Developed for sealing and coating match plates, core-boxes, etc. Can be applied over shellacked or new wood surfaces.
Plastic Shapes	**Plastikmould** **Plastiktrim**	Extruded plastic shapes, manufactured in a wide range of colors and in the form of rods, tubes, and other commercial parts, both flexible and rigid.	Designed for use where aluminum products of similar shapes and sizes have been utilized.
Die Impression Compound	**Plasul Basolit**	An impression checking material that is very light, does not shrink, and will show the finest markings of a form or die.	Particularly adapted for checking impressions of forging and die-casting dies. Can be used in place of wood patterns because of dimensional stability.
Refractory	**Plicast L-W-1**	A light-weight insulating refractory that can be cast. Thermal conductivity less than 30 per cent that of ordinary firebrick. For service temperatures up to 2200 degrees F. Weighs only 50 pounds per cubic foot after drying. Supplied in dry powder form, ready for mixing with water.	Within its temperature range suitable for use as refractory lining in heat-treating, annealing, stress-relieving, and carburizing furnaces; burner blocks in boilers; ducts and breechings; water walls.

Review of Some Recently Developed Materials— Continued

Class of Material	Trade Name	Properties	Applications
Protective Compound for Hands	**Ply-Rustex**	Forms a protective coating that is inert with respect to oils, cutting compounds, and other materials encountered in industrial processes. It is non-toxic and harmless to the skin.	For use on hands to prevent perspiration corrosion of highly polished surfaces when handled.
Bronze Hardener	**P-M-G Hardener**	A hardener used as a substitute for tin in bronze castings.	Suitable for use in bronze castings having tin content of 8 to 10 per cent, where savings in tin are needed.
Powdered Metal	**Porex**	A porous powdered metal product available in the form of disks, sheets, cylinders, truncated cones, and special shapes. Can be bonded to steel and copper and then, as an integral part of solid metal, is readily machined, ground, bored, or threaded.	Used as filter for such fluids as oil; to alter characteristics of gases by diffusion, reducing pressures and controlling flow rates. Applied in refrigeration systems, oil-burner systems, and paint spray equipment.
Babbitt Metal	**Power Nickel Genuine Babbitt**	Tensile strength, 17,500 pounds per square inch; yield point, 6500 pounds per square inch; and Brinell hardness, 27. Resistant to extreme local heat.	Adapted for heavy bearing loads, such as in railroad service, rolling-mill machinery, and paper-mill machinery.
Bearing Bronze	**Pre-Cast Bearing Bronze on Steel**	A thin-wall laminated type of bearing consisting of S A E 64 bronze bonded to steel. Has a higher Brinell hardness, lower coefficient of friction, and greater resistance to pounding and shock than ordinary cast bronze. Also available as a graphited bearing.	Available in plain or graphited form as finished bearings, washers, strips, or in rolls up to 400 feet in length.
Electrical Insulation Porcelain	**Prestite**	A porcelain for electrical insulation having a dielectric strength equal to that of wet-process porcelain, and a mechanical strength about 10 per cent greater under tension and cantilever loads. It is impervious to moisture.	Particularly adaptable for use in intricate shaped pieces; dimensions can be held accurate within 1 1/2 per cent.
Babbitt Substitute	**Pyramid**	A lead-base bearing metal suitable for use in place of tin-base babbitt.	Particularly suitable where bearings must withstand heavy sustained pressures, such as in marine reciprocating engines, water turbines, paper-mill calender stacks, and rolling-mill machinery.
Metal Finish	**Pyroflex**	An inorganic finish having all the features of porcelain enamel, but requiring only one-half the burning time of baked-on enamels. Withstands heat and hard usage.	Available in a wide range of colors and grain finishes for use wherever porcelain enamel is called for.
Coolant	**Quaker A. M. Base No. 11**	A clear claret-colored oil, which can be mixed as a base with kerosene.	For use as a coolant in cutting operations on aluminum, zinc, magnesium, and their alloys.
Piercing Compound	**Quaker Piercing Compound No. 10**	This compound, when sprayed or swabbed on punches, prevents sticking, increases punch life, eliminates pitting, and insures clean work.	For use in hot-piercing of shell forgings or other similar products.
Solvent Cleaner	**Quaker Quasol No. 80**	A solvent that can be mixed with hot or cold water for removing grease, oil, and dirt from all types of metals.	Suitable for use in pressure type washing machines. Acts as a rust preventive.
Protective Coating for Metals	**Resi Flex**	A coating said to be waterproof, oilproof, and impervious to mineral acids, alcohols, and gasoline. After application, the finish is baked on for a period of six to thirty minutes at 275 to 300 degrees F.	Applied as a protective coating for metals by dipping, brushing, or spraying.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Synthetic Substitute for Zinc Coating	**Roxaprene**	A corrosion-resistant synthetic coating that has shown a high degree of protection against caustic and acid solutions, in comparison with zinc coatings.	Used as a substitute for galvanized coatings on air-conditioning equipment, motor trucks, fans, blowers, pumps, and special machinery.
Vinylidene-chloride Plastics	**Saran**	Group of plastics ranging from a flexible, moderately soluble material with a softening point of 70 degrees C. to a hard, tough thermoplastic solid with a softening point of at least 180 degrees C. Tensile strengths range up to 60,000 pounds per square inch. These materials have a high degree of flexibility and resistance to fatigue. They are odorless, tasteless, non-toxic, and are characterized by extreme chemical resistance. In the form of tubing, the material is flexible, semi-transparent, and has unusual toughness and resistance to moisture, brine, solvents, acids, and alkalies. Has excellent fatigue resistance. Can be joined by standard couplings and fittings.	Available in the form of strong, flexible, rattan-like strands, extruded tubing, and other shapes. Used as a resinous bonding agent for new type of abrasive wheel. Can be molded by compression or injection. Almost any shade of color and degree of opacity can be obtained. Suitable as a substitute for copper tubing in applications not requiring high temperatures or very high pressures. Maximum temperature range, 250 to 275 degrees F. for short periods.
Bearing Material	**Selflube**	Bearings made of powdered iron saturated with oil. Have an average porosity of 25 to 35 per cent. For many applications original oil supply is sufficient for entire bearing life.	Interchangeable with bronze bearings in most applications.
Concrete Floor Cement	**Smooth-On No. 7B**	A wear-resistant iron-base cement that is dustproof, oilproof, and waterproof. Expands slightly on hardening.	For filling cracks, ruts, and shallow holes in concrete floors.
Open-hearth Steel	**Speed Case**	A specially processed, low-carbon, open-hearth, case-carburizing steel having the machinability of SAE 1112 and X1112 Bessemer screw stock, and the strength of SAE 1020, X1020, X1314, and X1315 open-hearth steels. Relatively high sulphur content makes dry machining possible. Can be cut at surface speeds of 220 to 300 feet per minute with greatly increased tool life.	Suitable for all types of broaching operations and cold heading, rolling, or crimping. Makes sound forgings and after forging, machines rapidly. Is readily welded by either electric-arc or gas process. Also useful for non-magnetic applications.
Hard-facing Rod	**Stoodite K**	A cast hard-facing rod consisting principally of molybdenum, tungsten, manganese, silicon, carbon, and iron. Deposits average 54 to 58 on Rockwell C scale, and are smooth, dense, and free from porosity and shrinkage cracks.	Available in bare form for oxy-acetylene application, and in coated form for direct-current electric application. Suitable for hard-facing where considerable pressure, impact, or abrasive wear is experienced, such as in agricultural tools, cement-mill parts, brick and clay equipment, and dredging and excavating equipment.
Hard-facing Rod	**Stoody Self-Hardening K**	A hard-facing rod made in the form of tubes with mixed alloys of molybdenum, manganese, silicon, carbon, vanadium, and iron on the inside. Deposits average 50 to 54 on Rockwell C scale, and are highly resistant to wear and considerable impact.	Forms excellent bond with manganese steel. Deposits can be forged at red heat. Recommended for hard-facing tractor parts, sheepsfoot tamper shoes, roll crushers, jaw crushers, gyratory crusher heads, conveyor buckets, dredge pump impellers, and other equipment subjected to severe wear and impact.
Plastic Valve Packing	**Super-Seal**	Improved packing that utilizes non-frictional, vulcanized tape in place of frictional woven-cotton jacket. The packing contains a dry-graphitized plastic material made from long-fiber asbestos, anti-frictional metal particles, and special binders.	Suitable for centrifugal and rotary service, as in feed-pumps, low-pressure steam rods, expansion joints, etc.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Aluminum Alloy	**T-1**	A copper-tin-magnesium-zinc alloy of aluminum developed for heat-treated sand castings. Without heat-treatment, it has a tensile strength of 30,000 to 33,000 pounds per square inch; an elongation in 2 inches of 6 to 10 per cent; and a Brinell hardness of 60 to 78. Also has good resistance to salt water corrosion.	Can be used without heat-treating and quenching, and can be welded without deterioration in physical properties. Meets all requirements of U. S. Air Corps Spec. 11324 and 11325, and U. S. Navy Aeronautical Spec. M-397.
Heat-treating Process	**Tuff-Hard**	A method of heat-treating tools that enables them to remove a considerably increased amount of material per stroke or revolution.	For improved cutting ability of tool steels, particularly molybdenum high-speed steel.
Alkaline Copper-plating Process	**Unichrome**	An alkaline copper-plating process that provides a smooth, fine-grained base for bright nickel-plating. The plating bath is non-corrosive to flesh, clothing, and equipment, and forms no salt crust on tank, work-rods, or anodes.	Use of this process makes possible a reduction in the amount of nickel used for plating.
Conductive Belting	**Uskon**	Rubber belting that does not accumulate static electricity, ordinarily generated by friction on belting surfaces.	Applicable in locations where discharge of accumulated static electricity might produce fire or explosion. Useful also for carrying paper or cellophane which ordinarily adheres to statically charged belting.
Rubber Construction Material	**U. S. Royal Insulation Board**	Cellular rubber, consisting of thin external dense layer enclosing microscopic cells of nitrogen gas in a matrix of rubber. Heat transmission is 0.237 B.T.U. per hour per degree F. difference (12- by 12- by 1-inch specimen). This material is moisture-resistant; rot-proof; and oil-, acid-, and fire-resistant. It can be sawed and planed, and can also be shaped when heated.	For use as heat insulation material and also in supports for self-sealing airplane gas tanks.
Blackout Paint	**Valdura Black-Out**	A paint that can be sprayed or brushed on windows to prevent all passage of light. It can be readily removed.	Suitable for blacking out windows and skylights of industrial plants.
Aluminum Paint Substitutes	**Valdura Defense Grays**	Two shades of gray paint having a high glossy finish and good resistance to rain, sun, grime, smoke, and oxidation.	Designed to provide metal surfaces with effective protection and long durability.
Aluminum Paint Substitute	**Valdura Enamelized Yellow Metal Primer**	Can be used under water when covered by one or two coats of Defense Gray. The light yellow color requires only a single coat of finishing paint to hide primed surface.	Designed for all types of metal surfaces, especially where exposed to extremely damp, wet, or foggy conditions.
Aluminum Paint Substitute	**Valdura Metal Lead**	The metallic lead in this paint provides a leafing action similar to that of aluminum, and affords a coating highly resistant to acids, alkalies, oxidation, and moisture. Will resist temperatures up to 225 degrees F.	Provides a protective metal coating for all metal surfaces, including new or old galvanized metal. Can be used as a general paint primer, except under paints containing asphalt.
Aluminum Paint Substitute	**Valdura Tank White**	This paint has a reflectivity factor 10 to 15 per cent higher than aluminum paints, and is resistant to oil and water.	As a substitute for aluminum paint where it is desirable to cut evaporation losses and reduce inside temperatures.

Review of Some Recently Developed Materials—Continued

Class of Material	Trade Name	Properties	Applications
Welding Rods and Fluxes	**Weldoloy**	Rods and fluxes for oxy-acetylene welding and brazing at low temperatures. Various types are available for different classes of work. *Type CI-514*, which is the color of cast iron, is a medium hard material with good machining qualities. It has a fusing temperature of 1500 degrees F. and a tensile strength in the weld of 47,000 pounds per square inch. *Type ST-516*, of a silver-white color, has a fusing temperature of 1350 degrees F., a weld tensile strength of 110,000 pounds per square inch. *Type BU-685*, which is of bronze color, has a fusing temperature of 900 degrees F., a tensile strength of 100,000 pounds per square inch, and a Brinell hardness of 235. It is noncorrodible, has a low coefficient of friction and can be highly polished.	*Type CI-514* is used for welding cast iron, filling up blowholes, and building up new material on worn-out castings. *Type ST-516* is used for butt-welding steel, stainless steel, chromium-nickel steel, molybdenum and vanadium steels, Carboloy and tungsten-carbide alloys, mild steel, and malleable cast iron. It is particularly suitable for welding thin steel sheets and tubing. *Type BU-685* is used for building up materials on worn-out parts of steel, cast iron, copper, brass, bronze, and nickel alloys. Useful for repairing guide faces, valve-seats, ship propellers, etc. *Type BB-518* is used for welding brass, bronze, copper, aluminum-bronze and nickel, and for welding copper alloys to iron, galvanized iron, and steel; *Type WM-688* for white-metal die-castings; *Type SA-690* for sheets and tubes of aluminum and its alloys; and *Type CA-710* for welding aluminum castings and for building up new material on worn parts.
Tool and Die Steel	**Windsor Special**	A chromium-molybdenum-vanadium type of steel which is air-hardening, easily machined, extremely tough, and has a wide hardening range.	Useful for tools or dies where the initial cost must be kept at a minimum. Can be hardened or tempered in either oil or air.
Plastic and Metal Adhesives	**XL-5041** **XL-5075**	Adhesive solutions made of Vinylite resins, which produce strong, impact-resistant, metal-to-metal or phenolic-to-phenolic bonds. Joining of parts is under heat and pressure.	Tension tests indicate a shear strength of 6000 pounds per square inch; impact strength is better than that obtained with regular grades of polyvinyl acetate.
Phenolic Plastic	**XM-15000**	Has high impact strength and relatively good water resistance. Can be preformed on automatic tabletting machines.	Recommended for molded parts subject to temperatures up to 300 degrees F.

Machine Tool Production Reaches New Record Level

According to information issued by the War Production Board, 28,300 new machine tools were shipped from the plants of American machine tool builders during July, the last month for which complete statistics are available. The value of these machines was $113,600,000. In the month of June, 26,600 machine tools were shipped, valued at $111,100,000. Production during July was at the rate of more than $1,360,000,000 worth a year. For the entire year of 1941, the value of the machine tool output was $771,400,000; the present rate shows an increase of more than 76 per cent over that value.

Well Defined Labor Policy Essential to Successful Conduct of War

If the successful conduct of the war is not to be seriously hampered, the Government must proclaim—either through Congressional action in the form of legislation or by an executive order from the President—a well defined policy that will safeguard the rights of both labor and industry, and, at the same time, lay down the duties of both under wartime conditions. Strikes in war-equipment industries for the purpose of gaining union organization advantages at the expense of war production must be outlawed. This is no time for any group of citizens to seek advantages at the expense of the rest of the nation.

Preventing Waste and Spoilage in Manufacturing Operations

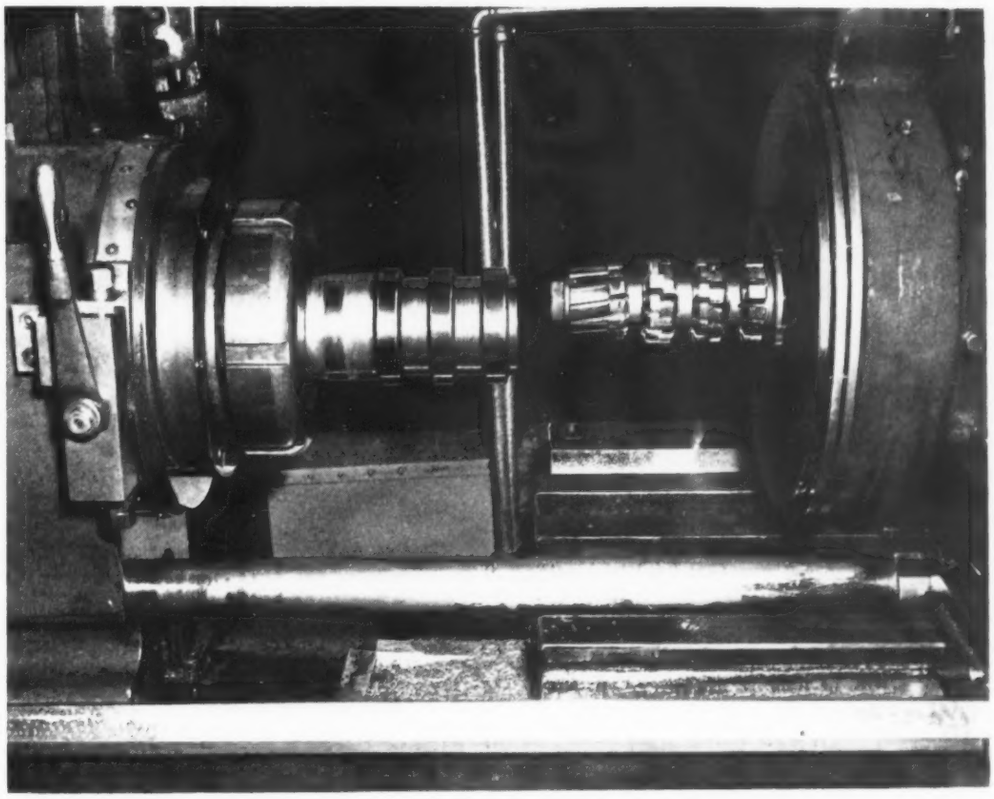
The General Electric Co., in making a special effort to conserve materials and to reduce waste and spoilage in manufacturing operations, has been able, according to a statement issued some time ago, to reduce such waste by 13 per cent, as compared with five years ago. For years the company has conserved materials through an internal organization for the salvage of waste and an organization for the study of manufacturing methods with a view to keeping waste and spoilage at a minimum. The company has invested $325,000 in buildings and equipment, and maintains a personnel of 250 people for this work. More than half a million dollars a year is spent for labor and operating expenses of the salvage department. It is of interest to note that it costs about 20 cents to salvage a dollar's worth of material. The marketable waste products handled annually exceed 100,000 tons, or approximately 3000 carloads.

Scrap is disposed of in three ways. As much as possible is used within the plants. This amounts to about 20 per cent. Other scrap is shipped, when practicable, to smelters for conversion into raw materials, and returned to the company. This is true particularly with respect to copper, silver, brass, lead, and compositions. The remainder is sold outright to competitive bidders. For selling purposes, the scrap is divided into about 125 classes, each having a different price. The scrap includes a great variety of materials, such as steel, iron, copper, brass, compositions, lead, babbitt, solder, tin, paper, insulation, zinc, and aluminum. Of this, steel comprises 75 per cent by weight and iron 10 per cent by weight.

* * *

Milling Annular Rings for Locomotive Piston-Rods

A Lees-Bradner thread-milling machine is used by the American Locomotive Co., Schenectady, N. Y., for form-milling annular locking collars on the end of piston-rods of the type used with split cross-heads. A typical operation is shown in the accompanying illustration. Four cutters mounted on the tool-spindle are simply fed sidewise into the work in this operation. The illustration shows the tool-spindle withdrawn to the right to give a clear view of the cutters. The diameter of the collars is 5.495 to 5.498 inches, while the grooves between the collars are 4.620 to 4.625 inches. These collars and grooves are subsequently ground in order to obtain the required finish.



Thread-milling Machine Set up for Form-milling Integral Collars around the End of a Piston-rod for a Split Cross-head

Cemented-Carbide Tipped Tools Increase

WITH the volume of traffic handled by the railroads breaking all previous records, it has become necessary for the repair shops of this industry to strive for maximum efficiency in producing, rebuilding, and repairing locomotives and rolling stock. One of the steps taken to meet the unprecedented demands on these shops has been the application of cemented-carbide tipped tools to certain machining operations. The use of Kennametal cemented-carbide tools, made by the McKenna Metals Co., has resulted in notable increases in production and lower tool and labor costs.

The rough-boring of a 56-inch locomotive tire, 5 3/4 inches wide, as shown in Fig. 1, required thirty-one minutes when performed with the tool previously employed, the work running at a surface speed of approximately 45 feet per minute, and a 1/16-inch feed being used. In addition to this operation, a finishing or second cut was required.

With cemented-carbide tools, the roughing and finishing operations were performed simultaneously; using a speed of 10 R.P.M. (or approximately 150 surface feet per minute), a 3/16-inch depth of cut, and a finishing cut 1/16 inch deep, the machining of the tire was completed in about eighteen minutes. This represents a saving in man- and tool-hours of 42 per cent. If allowance is made for the second or finishing cut necessary with the tools previously used, the saving would be approximately 58 to 60 per cent.

In another prominent railroad shop, the same type of operation performed on 66-inch tires in a 100-inch boring mill was handled at the rate of sixteen tires per eight-hour period, including roughing and finishing cuts with cemented-carbide tools, compared with eight tires per eight-hour period using the tools previously employed.

The roughing tools used in the operation were Kennametal Style 12, Grade KH, size 1 1/2 by 1 3/4 inches, ground with a 2-degree negative back rake, a 6-degree side rake angle, and a 2-degree side and front clearance. In this case, the speed was 10 R.P.M., and the feed 0.033 inch. The finishing tool was a Kennametal standard 6T80, Grade KH. Both tools operated simultaneously.

In all cases, the tires bored with cemented-carbide tools had a mirror-smooth finish and were straight-bored, while those machined with the tools previously used were rough and, in some cases, tapered. A smooth accurate surface is, of course, an important factor in avoiding failure in locomotive tires. The rough torn surface characteristic of the bore made by ordinary tools at low speed has thousands of tiny fractures, which, after the tire is shrunk on the wheel and subjected to fatigue, may develop into cracks that ultimately will result in tire failure under conditions endangering life and the safety of equipment. The rough non-reflecting surface of the bore is due to the breaking up of the light waves by the tiny fractures. This condition is eliminated when the tires are machined at the higher cutting speeds possible with cemented-carbide tools.

Substantial savings in turning piston-rods have also been made by using cemented-carbide tools. Piston-rods made from rough forgings having a Brinell hardness of 340 to 350 are being turned to grinding size, with the dimension shown in Fig. 2, in about one hour and ten minutes, as against an average of four hours using the best tools previously employed. These results have also been duplicated in many other railroad shops.

Locomotive frame bolts are also being turned from S A E 2115 hot-rolled hexagonal bar stock in one cut on a turret lathe using a cemented-carbide box-tool in about one-sixth the time required using the best tool previously employed. The finish obtained has the appearance of a finish-ground surface.

Locomotive-piston valve stems are being finished with cemented-carbide tools from rough forgings of 0.50 carbon, heat-treated steel, having a Brinell hardness of 250 to 270. The shape of the forgings for one of these valve stems is shown in Fig. 3. In this case, with a speed of 266 R.P.M. and a feed of 0.016 inch, taking one cut only, the time required for finishing the part, ready for the grinding operation, was reduced from one piece in two hours to one piece per hour. From seven to eight pieces were finished per grind of the Kennametal Style 11, Grade KM 1- by 1 1/2-inch tool, which was employed for this job. The piece finished by this operation is shown in Fig. 4.

A cross-head wrist-pin is machined from a solid steel forging, approximately 7 3/4 by 13 inches in size, to the dimensions shown in Fig. 5 with a Style 11 KM tool, 1 by 1 1/2 inches, at a speed of 113 R.P.M., taking a cut 3/4 inch deep with a feed of 0.009 inch, in about forty minutes floor-to-floor time. The time required with the tool formerly used was sixty minutes. The cemented-carbide tool finished five pieces per grind as against two and one-half pieces per grind for the tool previously employed.

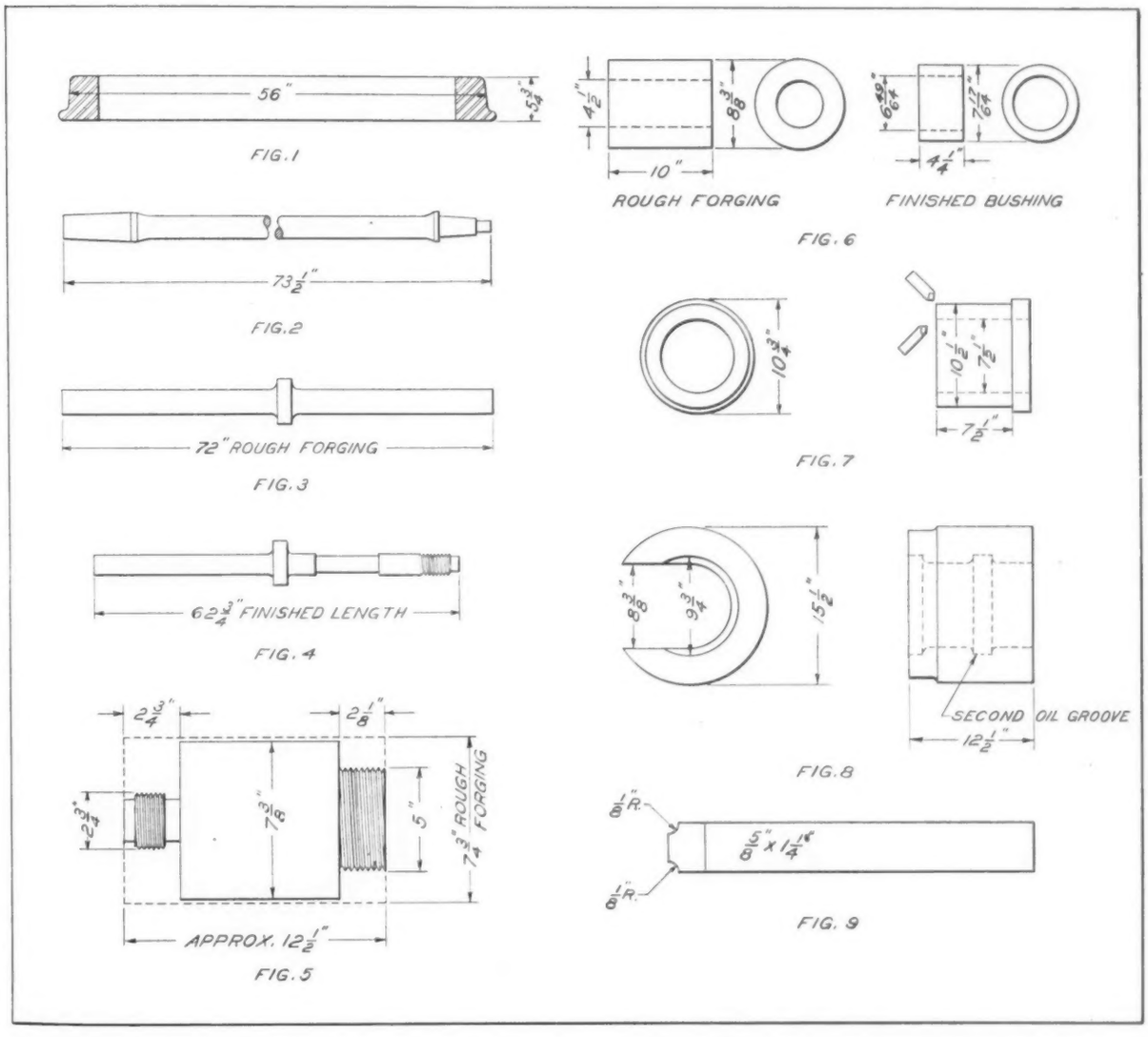
There are many small parts used in locomotive and car construction which, considered as a group, tie up a considerable proportion of the

Efficiency in Railroad Maintenance Shops

shop machining capacity. The individual cost of these small parts is so low that their importance is frequently overlooked. The total cost, however, of the large numbers of such parts required may represent a substantial sum.

Among these small parts may be mentioned the draw-bar hinge bushing shown at the right in Fig. 6. These bushings are rough-forged from 0.50 carbon steel. They are faced, bored, and turned in pairs, and after being finish-machined are split, each forging thus producing two bushings such as indicated in Fig. 6. With cemented-carbide tools, five to six forgings are completed in an eight-hour period, the work being rotated at a speed of 113 R.P.M., using a feed of 0.020 inch. Ten pieces are produced per grind, on an average. With the tool previously employed, only two and one-half to three bushings were finished in an eight-hour period, and it was necessary to regrind the tool after finishing one to three pieces.

A crankpin collar (not illustrated) requiring similar operations was machined from rough forgings of 0.50 carbon steel, heat-treated to a Brinell hardness of 250 to 270. These collars were very difficult to machine because of the scale and hardness. With the tools originally employed, a maximum of ten pieces was produced in an eight-hour period, whereas, with the cemented-carbide tools, twenty-four pieces were



Examples of Railway Repair Shop Work on which Production has been Increased and Tool and Labor Costs Decreased by the Use of Cemented-carbide Tools

produced in eight hours, the speed being 152 R.P.M., and the feed 0.022 inch. On this operation, an average of twenty pieces was produced per tool grind.

Numerous applications of cemented-carbide tools to the cutting of metals other than steel—such as bronze, brass, etc.—have also afforded marked savings. All the preceding examples relate to machining steel, which represents the bulk of the work handled in railroad shops. The following, however, are a few of the many applications on non-ferrous metals, in which substantial savings have also been obtained by using cemented-carbide tools.

For machining rod brass stock, the Kennametal cemented-carbide tools recommended are the Style 32 for outside turning, and Style 31 for inside boring, on work such as shown in Fig. 7. The positive back rake on these styles makes them particularly well fitted for brass-cutting. Operating at 86 R.P.M., with a feed of 0.042 inch, it is claimed that these tools have increased production as much as 75 per cent. For this work, it is recommended that tools be ground with a 6-degree front and side clearance, and zero side and back rake angle.

A driving-box brass, like the one shown in Fig. 8, involves intermittent cutting. After finish-boring, the fixture is offset and the oil-grooves bored. In rough-facing the top, a cut 1/8 to 3/8 inch deep is taken. A standard Kennametal No. 15 tool, ground with two radius-formed surfaces (Fig. 9), is used both for finish-boring and for turning the second oil-groove.

"Heliarc"—A Process for Magnesium Welding

AFTER a research period covering two years, Northrop Aircraft, Inc., Hawthorne, Calif., has developed a new process known as "Heliarc" welding. This development makes it possible to arc-weld magnesium sheets, tubing, and extruded shapes. In addition, a method has been developed for treating magnesium to make it less inflammable and more resistant to heat. It is believed that the use of magnesium-welded structures may eliminate the tens of thousands of rivets now required in airplanes.

While magnesium has been used for some time in the aircraft industry for engine parts, wheels, and accessories, it has never before been used extensively as a structural material in the construction of the plane itself, because of difficulties in fabrication. The new welding process is believed to make possible what might be termed an "all-magnesium plane."

Furthermore, magnesium castings having foundry defects can be repaired by this process. Welds equal to, or stronger than, the surrounding metal have been obtained. The weld metal is more dense than that of the surrounding cast metal, and less susceptible to corrosion. Almost any thickness of magnesium metal that can be cast can be readily welded. Welding rod of the same alloy as the parent metal is usually employed for castings and wrought-magnesium alloys.

It is stated that Dowmetal J-IH magnesium alloy, when Heliarc welded, has approximately 95 per cent of the strength of the parent metal in the weld area. However, at present the design safety factor for welded Dowmetal J-IH alloy is taken as 75 per cent of the strength of the parent metal. These strength values are based on butt-welded joints. Fillet, lap, edge, or corner welds are weaker than the butt-welded joints.

The Heliarc welding process has been applied successfully on magnesium, stainless steel, brass, Inconel, Monel, and some of the carbon steels. Research work is now in progress to extend its use to aluminum and to carbon steels not heretofore Heliarc-welded.

In the Heliarc welding process, a shield of helium gas envelops the molten metal. Because helium is an inert gas, it prevents oxidation, makes unnecessary the use of a flux, and obviates the danger of entrapped flux in the weld. The arc in this process is produced directly between a tungsten electrode and the base metal, rather than between two tungsten electrodes, as is the practice in atomic hydrogen welding. The tungsten electrode is very slowly alloyed with the weld metal, and obviously, must, in time, be replaced. No increase in the corrosion rate of Heliarc welds in magnesium alloys due to the presence of tungsten have been noted.

A special welding torch has also been developed by Northrop Aircraft, Inc. These torches will shortly be available to industry. Specific instructions for welding by the new process will also be provided.

* * *

The Civil Service Commission at Washington recently announced two new examinations for metallurgists, one for positions paying from $2600 to $5600 annually, and one for junior grade positions with a salary of $2000 a year. Complete information and application forms can be obtained from the Civil Service Commission, Washington, D. C., or from local post offices.

Lodge & Shipley Completes Fifty Years of Lathe-Building

THE Lodge & Shipley Machine Tool Co. of Cincinnati, Ohio, completes this year fifty years in the lathe-building field. Because of the pressure of war production, there will be no formal celebration of the company's Golden Jubilee, except for the distribution of a Jubilee Book, containing a history of the company and illustrations of its products in times of peace, as well as war.

Founded a half a century ago in small quarters in downtown Cincinnati, the firm has expanded progressively through the years until it has become one of the best known builders of lathes in the world. It was in 1892 that William Lodge and Murray Shipley, Jr., established the company known as Lodge & Shipley. Mr. Lodge had previously been a partner in the firm of Lodge & Davis, a concern engaged in building and selling various types of machine tools. Believing that a machine tool builder could make a better product by concentrating on one type of machine, Mr. Lodge decided to specialize in the building of lathes. The slogan of the company from that time to this has been "Lathes, Good Lathes Only."

For nearly a quarter of a century, with Mr. Lodge at the helm, the firm sold its lathes internationally. Then came the first World War, which brought such a deluge of war orders that it became necessary to expand the plant now located at 3055 Colerain Ave., where the establishment had been housed since 1897.

Upon Mr. Lodge's death in 1917 he was succeeded in the management of the business by J. Wallace Carrel, who held the position of vice-president and general manager for twenty-three years. Shortly after Mr. Lodge's death, the Shipley interests were purchased, and the firm has been owned since entirely by the Lodge family. Mrs. Mary G. Lodge, wife of the founder, who is still living, served as president of the company following the death of her husband, and maintained a close contact with its development, while leaving the active management in the hands of Mr. Carrel.

Mr. Carrel died in December, 1940, and at a meeting of the Board of Directors, early in 1941, the present officers were elected. Serving as president and general manager is William Lodge Dolle, grandson of the founder. He learned the business from the ground up, taking employment in the shop as an ordinary beginner after completing his college education. Fred Albrecht is vice-president and treasurer. He has been associated with the company in various capacities for thirty-five years, starting in the office and becoming, in turn, office manager, sales manager, and treasurer.

Another grandson of the founder, Louis Lodge Weber, also started in the shop to learn the basic principles of machine tool manufacture. After having held various positions of responsibility in the shop, he transferred his activities to the commercial end of the business, becoming secretary in 1937. Fred Schoeffler, works manager, became connected with the company in 1906 after completing his apprenticeship, and advanced steadily to the positions of foreman, superintendent, and finally to his present post as works manager.

Before the United States declared war on the Axis powers, Lodge & Shipley had been supplying the other United Nations, principally Great Britain, with lathes for war purposes. Many contracts had also been received from the United States Government and companies engaged in defense goods production. After Pearl Harbor, the production of the company increased to such an extent that an around-the-clock schedule was established.

Three months after the United States entered the war, the company was presented with the Navy "E" for production achievement. As the production pace utilized all the facilities of the pre-war plant, the company acquired last April a group of buildings suitable for manufacturing that were formerly occupied by the LeBlond-Schacht Motor Co. and the Ahrens-Fox Fire Engine Corporation. This acquisition provided 81,000 additional square feet of area for production. The recently acquired plant is now equipped for automatic lathe building.

The Lodge & Shipley Machine Tool Co. is to be congratulated on its long record of achievement in both war and peace time. The high standard that it has maintained throughout the years has made Lodge & Shipley lathes known all over the world.

* * *

According to the Automotive Council for War Production, a perforated false bottom in the sheet-steel containers used for carting away oil-saturated chips from machines has proved a simple way of salvaging oil. This allows the cutting oil to seep through and be poured off, and eliminates a large loss of lubricant.

Machining Cones and Cups for Railway Roller Bearings

Some of the operations employed in the production of tapered roller bearings for railway applications at the plant of the Timken Roller Bearing Co. in Canton, Ohio, were described in an article published in the April, 1942, number of MACHINERY. In that article, Potter & Johnston automatics and Foster Fastermatics were shown engaged in machining the cones and cups of the bearings.

In cases where these parts are required in limited quantities, use is made of Bullard vertical turret lathes, a machine of this type being shown in the accompanying illustration engaged in machining a double cup for a two-row tapered roller bearing. Seven cutters on the turret and four on the side-head are applied in machining the internal and external surfaces of the cups. The turret ram is positioned at an angle, as shown, to permit boring the tapered bearing seats as required. The outside diameter of the particular bearing cup shown gripped between the table jaws in the illustration is approximately 16 inches.

Machining the Double Cup for a Railway Tapered Roller Bearing on a Vertical Turret Lathe

Machine Tools Completely Wired before Installation

In the past, it has been customary for the buyers of many types of machine tools to provide the permanent electric wiring for these machines after they have been delivered and installed in their plants. This is especially true of the heavier types of machine tools. Since the users' electricians are not always familiar with the equipment being installed, particularly in the case of variable-voltage planer drives, for example, there is often considerable delay in getting the machine ready for use. With large planers, this delay has amounted to as much as several weeks after the machine has been erected in the plant of the user.

To obviate this trouble, the Cincinnati Planer Co., Cincinnati, Ohio, has been selling its equipment, for some years, permanently wired before shipment. The wiring is standardized, so that it can be prefabricated before the machine is erected on the assembly floor of the builder. All the wiring is identified by metal tags bearing numbers corresponding to those on the wiring diagram, so that any wiring that must be disconnected before shipment can be readily reconnected by the customer's electricians when the machine is installed.

As a result of this practice, it is now possible to start planers on production almost immediately after they have been erected, thereby considerably accelerating the war production effort.

* * *

Training Machine Tool Operators

Mechanically minded high school graduates are now being trained to operate some one type of machine tool after six months of intensive training. Since the supply of trained mechanics has now been fully exhausted, industry must rely upon such training to obtain operators for the constantly increasing war manufacture requirements. One company mentions that, out of three thousand applicants who visited its employment offices, only eleven were skilled men, but eight hundred were of a type that qualified for intensive training as operators of machine tools.

NEW TRADE LITERATURE

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 193 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the October Number of MACHINERY

Handbook of Special Steels

ALLEGHENY LUDLUM STEEL CORPORATION, Pittsburgh, Pa. Revised edition of this company's "Handbook of Special Steels," containing information on the various grades of stainless, tool, and other special alloy steels made by the concern. Complete data is also given on the proper selection, treatment, and use of these steels, together with other material of value to design engineers and production men. 1

Cleaning and Drying Machines

INDUSTRIAL WASHING MACHINE CORPORATION, New Brunswick, N. J. Bulletin illustrating and describing several metal cleaning and drying machines designed to meet specific needs or special problems, including conveyor type machines, submerged type machines, rotary drum machines, plating, drying, and washing units, and cabinet washing and drying machines. 2

Sub-Contracting for War Production

ABILITY & MACHINES, INC., P. O. Box 805, Milwaukee, Wis. Circular entitled "Ability and Machines on the Home Front," describing the make-up and service offered by a cooperative organization consisting of a voluntary association of small shops, factories, and individuals capable of acting as subcontractors for war production. 3

Cemented-Carbide Tools and Tips

FIRTH-STERLING STEEL CO., McKeesport, Pa. Blue book containing price list covering Firthite standard tools, general-purpose tools, and tips. Red book containing information on selecting and ordering Firthite standard and special tools, together with complete tables of dimensions. 4

Spark-Testing of Tool Steels

CARPENTER STEEL CO., Reading, Pa. Wall chart containing diagrams and information that will assist users of tool steels to identify different types of steels by their spark. The sparks shown are those of ten Carpenter matched steels, but the procedure described can be applied to spark-testing of steels in general. 5

Grinding-Wheel Data Book

ABRASIVE CO., DIVISION OF SIMONDS SAW & STEEL CO., Tacony and Fraley Sts., Philadelphia, Pa. Grinding Wheel Data Book, containing a fund of valuable information on grinding wheels, and the selection of the correct type for grinding different materials and classes of work. Tables of wheel and work speeds are included. 6

Facilities for War Production

T. SHRIVER & CO., Harrison, N. J. Booklet 116, listing this company's facilities and equipment available for war production. Copies can be obtained by those interested in placing sub-contracts for casting or machining tank, gun, or plane parts, or producing other war equipment. 7

Standard Steel List

BABCOCK & WILCOX TUBE CO., Beaver Falls, Pa. Technical Data Card 119, containing a complete list of standard steels of the American Iron and Steel Institute and the Society of Automotive Engineers. Copies can be obtained by making the request on a company letter-head. 8

Milling Machine Practice

CINCINNATI MILLING AND GRINDING MACHINES, INC., Cincinnati, Ohio. Booklet M-773-1, on milling machine practice, covering types of milling cutters and use of cutters, including correct speeds, feeds, etc., for different materials, as well as types of milling machines and attachments. 9

Straight and Angle Swivels for Line Connections

TRABON ENGINEERING CORPORATION, 1814 E. 40th St., Cleveland, Ohio. Engineering Bulletin 424, containing data on Trabon straight and angle swivels for making oil, grease, air, and other line connections between stationary and moving surfaces. 10

Forged-Steel Fittings

WATSON-STILLMAN CO., Roselle, N. J. Bulletin A-3, describing 166 different kinds of forged-steel fittings available through distributors. Pressure-temperature charts and other engineering data are included. Copies will be sent to those making the request on a company letter-head. 11

Oil-Absorbent and Cleaning Compounds

TROJAN PRODUCTS & MFG. CO., 3130 S. Wabash Ave., Chicago, Ill. Circular describing "Quik-Sil," a compound that absorbs oil on shop floors. Circular on "Elektro-Purj-It," a compound for cleaning machinery and machine shops. 12

Grinding Machines

NORTON CO., Worcester, Mass. Bulletin entitled, "Today — Ordnance Grinding. Tomorrow — Roll Grinding," describing the provision made for adding a roll-crowning mechanism to the large traveling-wheel grinders now being used for ordnance grinding. 13

Power-Press Protection

JUNKIN SAFETY APPLIANCE CO., INC., 10th and Hill Sts., Louisville, Ky. Pamphlet entitled "Power-Press Protection," covering press maintenance, feeding methods, safety guards, inspection, operating personnel, lighting, and material-handling facilities. 14

Automatic Starters

ALLEN-BRADLEY CO., 1331 S. First St., Milwaukee, Wis. Bulletin describing the Allen-Bradley line of automatic reduced-voltage starters, including information on their selection for squirrel-cage motors. Automatic resistance starters are also described. 15

Plant Sanitation Manual

OAKITE PRODUCTS, INC., 26 Thames St., New York City. Illustrated manual discussing sanitary measures in metal-working plants, and describing Oakite Deodorant No. 1, a newly developed material that deodorizes, cleans, and disinfects. 16

Gage-Blocks and Inspection Equipment

GEORGE SCHERR CO., INC., 128 Lafayette St., New York City. Booklet entitled, "Your Own Inspection Laboratory," the aim of which is to assist war production plants in selecting equipment for an inspection department. 17

Manganese-Steel Wheels and Rollers

AMERICAN MANGANESE STEEL DIVISION OF THE AMERICAN BRAKE SHOE & FOUNDRY CO., 389 E. 14th St., Chicago Heights, Ill. Bulletin 842-WS, covering manganese-steel wheels and rollers for cars, conveyors, cranes, etc. 18

Copper-Plating Process for Use in Steel Hardening

UNITED CHROMIUM, INC., 51 E. 42nd St., New York City. Bulletin 29, describing the Unichrome alkaline copper-plating process for use in the selective hardening and deep-drawing of steel. 19

Flexible-Shaft Machines

R. G. HASKINS CO., 617 S. California Ave., Chicago, Ill. Pocket-size Junior Catalogue No. 1-F, showing typical portable flexible-shaft machines for different classes of work, indicative of the wide range of the Haskins line. 20

Press Brakes

CINCINNATI SHAPER CO., Cincinnati, Ohio. 64-page catalogue B-1, covering the company's line of press brakes and their many uses. Several pages of line illustrations show die designs for various classes of work. 21

Grinding Rifle Drills

W. F. & JOHN BARNES CO., 320 S. Water St., Rockford, Ill. Booklet containing information on the correct procedure to follow in grinding rifle drills, illustrated by large-scale photographs and diagrams. 22

Hydraulic Presses

A. B. FARQUHAR CO., LTD., 175 Duke St., York, Pa. Bulletin 42-S-HP, showing typical examples of the line of hydraulic presses made by this company, ranging from 3-ton bench presses up to 7200-ton forging and extrusion presses. 23

De-Scaling Manual

OAKITE PRODUCTS, INC., 26 Thames St., New York City. Descaling and cleaning manual, describing safe, economical methods for effectively and speedily removing scale and rust from metal surfaces and machined parts. 24

Machining Aluminum

ALUMINUM CO. OF AMERICA, Pittsburgh, Pa. Booklet entitled "Machining Alcoa Aluminum," dealing with general machine shop practice and practices employed in automatic screw machine operations. 25

Welding Rods

AMERICAN MANGANESE STEEL DIVISION OF THE AMERICAN BRAKE SHOE & FOUNDRY CO., 389 E. 14th St., Chicago Heights, Ill. Bulletin 742-W, on Amsco Dieweld welding rods and electrodes for salvaging and hard-surfacing dies. 26

Heat-Treating Equipment

LEEDS & NORTHRUP CO., 4921 Stenton Ave., Philadelphia, Pa. Catalogue N-33A, covering Micromax thermocouple pyrometers for temperature measurement and control. 27

Atomic-Hydrogen Electrode-Holders

GENERAL ELECTRIC CO., Schenectady, N. Y. Bulletin GET-1062, describing the progressive steps in adjusting and operating atomic-hydrogen electrode-holders. 28

Alternating-Current Welders

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. Booklet B-3090, describing alternating-current welders for use with the Unionmelt process to speed industrial production. 29

Regrinding of Metal-Cutting Tools

NORTON CO., Worcester, Mass. Booklet entitled "How to Increase Tool Life," describing the proper procedure and equipment for regrinding metal-cutting tools. 30

Selection and Use of Mounted Wheels

CHICAGO WHEEL & MFG. CO., 1101 W. Monroe St., Chicago, Ill. Manual covering all types of mounted wheels and a wide variety of portable tool accessories. 31

Screws

MANUFACTURERS SCREW PRODUCTS, 216-222 W. Hubbard St., Chicago, Ill. Catalogue and Price List No. 14, covering the complete line of screws made by this company to meet a wide range of fastening requirements. 32

Diamond Wheels for Cartridge Dies

J. K. SMIT & SONS, INC., 157 Chambers St., New York City. Folder containing information on the application of diamond wheels for the internal grinding of cartridge dies. 33

Tubing for Rifle-Receiver Sections

SUMMERILL TUBING CO., Bridgeport, Montgomery County, Pa. Circular illustrating rifle-receiver sections made from special seamless tubing drawn to shape. 34

Vinylite Resins

CARBIDE AND CARBON CHEMICALS CORPORATION, 30 E. 42nd St., New York City. Booklet describing briefly the four major types of vinyl resins—their forms, properties, and the plastic materials produced from them. 35

Precision Collet Chucks

ERICKSON STEEL CO., E. 80th St. and Bessemer Ave., Cleveland, Ohio. Circular descriptive of the Erickson precision collet chuck with eight-point grip, adaptable for any type of machine or set-up. 36

Bearing Metals

MAGNOLIA METAL CO., 18 W. Jersey St., Elizabeth, N. J. Bulletin on bearing metals, describing lead-base metals which have proved to be excellent substitutes for tin-base bearing metals. 37

Electrode-Holders

JACKSON PRODUCTS, 3265 Wight St., Detroit, Mich. Circular descriptive of a new "Quik-Trik" electrode-holder with detachable "stinger," designed for faster production welding. 38

Lathes

NEBEL MACHINE TOOL CO., 3401 Central Parkway, Cincinnati, Ohio. Catalogue illustrating and describing the complete line of engine lathes and gap lathes made by this company. 39

Lathes

SOUTH BEND LATHE WORKS, Department M2, South Bend, Ind. Catalogue 100-B, describing the entire South Bend line of engine lathes, tool-room lathes, and turret lathes. 40

Plastics

BAKELITE CORPORATION, 30 E. 42nd St., New York City. Booklet entitled "Bakelite Laminating Plastics," describing laminating varnishes and manufactured laminated plastic products. 41

Electronic Control for Welding

WESTINGHOUSE ELECTRIC & MFG. CO., East Pittsburgh, Pa. 38-page booklet giving simplified explanations of electronic control for resistance welding. 42

Designing Molded Plastic Parts

GENERAL ELECTRIC CO., Pittsfield, Mass. Booklet entitled "Designing Molded Plastic Parts," of interest to product engineers and designers. 43

Balancing Machines

BEAR MFG. CO., Industrial Division, Rock Island, Ill. Booklet describing Bear dynamic balancing machines, and containing data on the dynamic balancing process. 44

Safe Crane Operation

WHITING CORPORATION, 157th St. and Lathrop Ave., Harvey, Ill. Safe crane operation manual, containing rules for the guidance of crane operators and their assistants, designed to prevent accidents. 45

Blast Cleaning Equipment

AMERICAN FOUNDRY EQUIPMENT CO., 555 S. Byrkit St., Mishawaka, Ind. Illustrated manual on the care and operation of Wheelabrator airless, abrasive, blast cleaning equipment. 46

Roller Bearings

BOWER ROLLER BEARING CO., Detroit, Mich. Bulletin describing the features of the Bower tapered roller bearing and its suitability for use in war production. 47

Dermatitis Prevention

STANDARD SAFETY EQUIPMENT CO., 232 W. Ontario St., Chicago, Ill. Circular describing safety garments and skin shields for the prevention of dermatitis. 48

Welding Alloys

EUTECTIC WELDING ALLOYS, INC., 40 Worth St., New York City. Catalogue entitled "Welding's Greatest Advance — Castolin Eutectic Low-Temperature Welding." 49

Electric Motor Control for Training Schools

CUTLER-HAMMER, INC., 315 N. 12th St., Milwaukee, Wis. Booklet entitled "Electric Motor Control for School Workshops." 50

To Obtain Copies of New Trade Literature

listed on pages 191-194 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail to:

MACHINERY, 148 Lafayette St., New York, N. Y.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

Name ..... *Position or Title* .....

[This service is for those in charge of shop and engineering work in manufacturing plants.]

Firm .....

Business Address .....

City ..... *State* .....

[SEE OTHER SIDE]

Plastic Parts for War Production

CREATIVE PLASTICS CORPORATION, 963 Kent Ave., Brooklyn, N. Y. Leaflet illustrating typical plastic parts designed for war production. 51

Corrosion-Resistant Coatings

CARBOZITE CORPORATION, First National Bank Bldg., Pittsburgh, Pa. Folder on Carbozite corrosion-resistant coatings for steel, wood, and concrete. 52

Lubricants

NATIONAL GRAPHITE CO., INC., 17 John St., New York City. Bulletin 3-A, on Hydrite lubricant—an all-purpose colloidal natural graphite. 53

Electric Hoists

LO-HED HOIST DIVISION OF THE AMERICAN ENGINEERING CO., Philadelphia, Pa. Pocket-size folder entitled "Lo-Hed, the Balanced Hoist." 54

Diamond Wheel-Dressing Tools

WILLEY'S CARBIDE TOOL CO., 1340 W. Vernor Highway, Detroit, Mich. Folder on diamond wheel-dressing tools. 55

Cleaning Equipment

L & R MFG. CO., 54-56 Clinton St., Newark, N. J. Leaflets illustrating and describing L & R heavy-duty precision cleaning machines. 56

Planers

OHIO MACHINE TOOL CO., Kenton, Ohio. Bulletin 500, illustrating and describing this company's line of standard and heavy-duty double-housing planers. 57

Lift-Trucks

BARRETT - CRAVENS CO., 3262 W. 30th St., Chicago, Ill. Bulletin illustrating and describing the "PowerOx," a new electrically operated lift-truck. 58

High-Speed Steel

JESSOP STEEL CO., Washington, Pa. Bulletin on Mogul high-speed steel, giving analysis, physical properties, typical applications, and heat-treatment. 59

Electric Equipment

GENERAL ELECTRIC CO., Schenectady, N. Y. Leaflet GEA-3619, descriptive of the crest voltmeter for measuring repeated-impulse voltages. 60

Visual Control

TABLET & TICKET CO., 1021 W. Adams St., Chicago, Ill. Bulletin on visual control of raw materials, production, quotas, loadings, etc. Illustrations show typical production control boards. 60-A

Bronze-Coated Electrodes

AMPCO METAL, INC., Milwaukee, Wis. Bulletin describing Ampco-Trode 10 — an all-purpose coated aluminum-bronze electrode. Procedures for various types of welding are given. 60-B

Metal-Forming Dies

CYRIL BATH CO., E. 70th and Machinery Ave., Cleveland, Ohio. Catalogue on metal-forming dies and special machinery. Examples of die designs are shown. 60-C

Electric Products

FEDERAL ELECTRIC PRODUCTS CO., Newark, N. J. 68-page catalogue containing engineering information on safety switches, panel boards, circuit-breakers, etc. 60-D

Gaskets and Packings

ARMSTRONG CORK CO., Lancaster, Pa. Circular showing industrial applications of Armstrong gaskets, packings, seals, etc. 60-E

Care of Rubber V-Belts

ALLIS-CHALMERS MFG. CO., Milwaukee, Wis. Booklet entitled "Plain Facts on Wartime Care of Rubber V-belts." 60-F

Electric Controllers

FURNAS ELECTRIC CO., Batavia, Ill. Catalogue 4201, covering the company's line of electric controllers. 60-G

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 195-210 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in October, 1942, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.

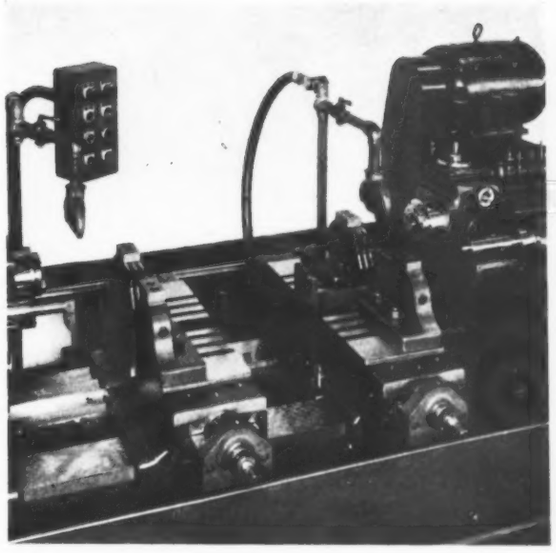
Fill in your name and address on other side of this blank.

Detach and mail to MACHINERY, 148 Lafayette St., New York, N. Y.

[SEE OTHER SIDE]

Shop Equipment News

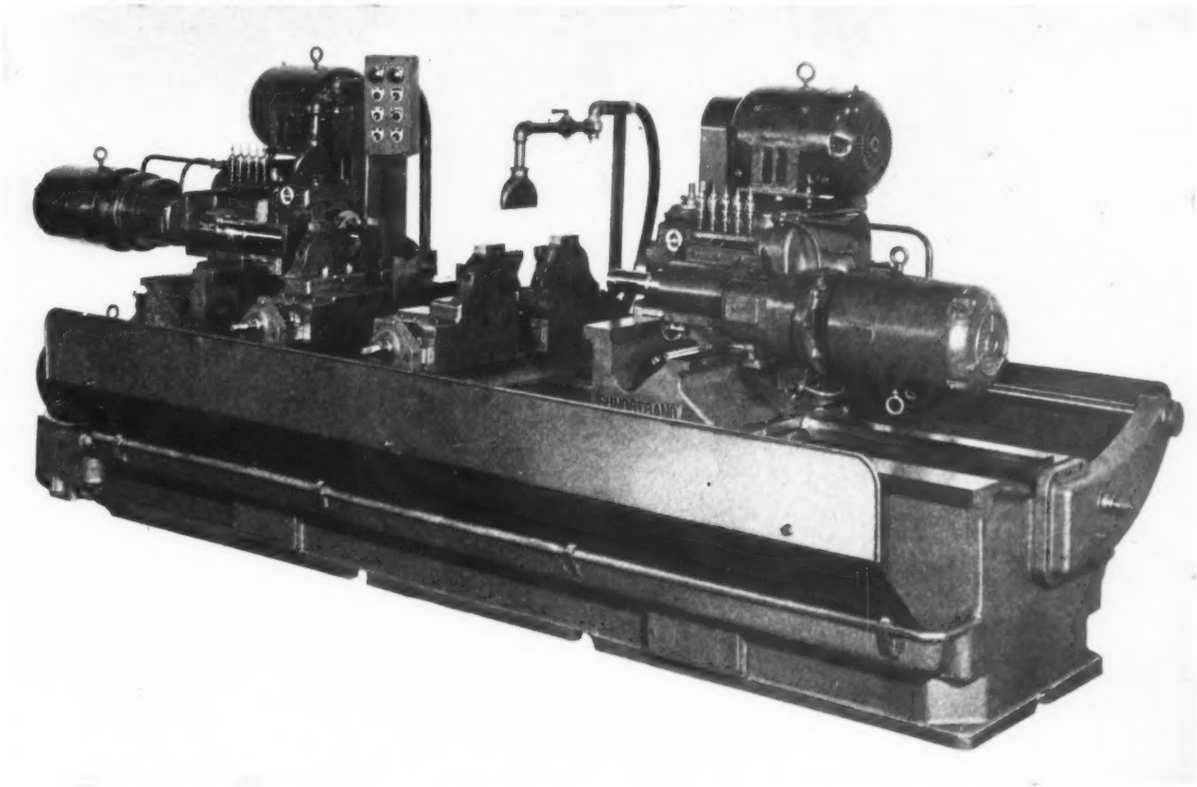
Machine Tools, Unit Mechanisms, Machine Parts, and Material-Handling Appliances Recently Placed on the Market



Sundstrand Double-End Milling and Centering Machine

The Sundstrand Machine Tool Co., 2530 Eleventh St., Rockford, Ill., has recently brought out a double-end milling and centering machine designed for milling to length and centering both ends of shafts in one handling. This machine will handle shafts ranging from 1 1/8 to 6 inches in diameter by 14 to 72 inches in length. The machine base consists of a one-piece cast-iron unit having horizontal ways. Crosswise of the bed ways are mounted two sub-bases, which, in turn, have ways on which cross-feeding heads are attached. The left-hand sub-base is fixed, but the right-hand base is adjustable for handling stock of various lengths.

Mounted on the bed ways between the two heads are two screw-operated self-centering vises. These vises also are adjustable for handling various lengths of stock. The drive to the heads is by means of a main shaft actuated by a fluid



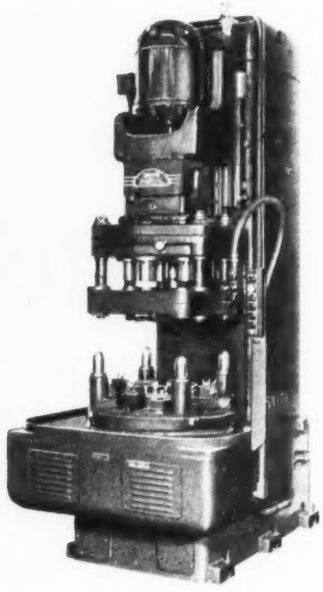
Double-end Milling and Centering Machine Designed by the Sundstrand Machine Tool Co.

To obtain additional information on equipment described on this page, see lower part of page 194.

motor. Each milling head is independently motor-driven, and carries a cam-operated automatic centering spindle.

When the machine is in operation, a shaft is loaded into the work-holding vises and the cycle-control button pressed to start the cross-feed of the heads. The heads travel toward the front of the machine, milling both ends of the part to length. At the completion of the cross-feed for milling, the heads are returned toward the rear of the machine by rapid traverse until the centering spindles are in the correct position, at which point they stop. The centering spindles automatically travel longitudinally in a cycle of rapid approach, feed, rapid return, and stop. This completes the cycle, and the operator then unloads and reloads the work-holding vises. Since the cycle is completely automatic, one operator can run several machines. The parts are handled but once; thus, the milling and centering operations are performed in their correct relationship.

Electrically operated vises can also be provided to further simplify loading and unloading of the work. The machine is furnished with Sundstrand hydraulic equipment, including a tank unit, fluid motor, and valves for providing the automatic cycle control for feeding the heads. A similar type of machine is available for handling shafts from 1 to 4 inches in diameter by 8 to 48 inches long. 61



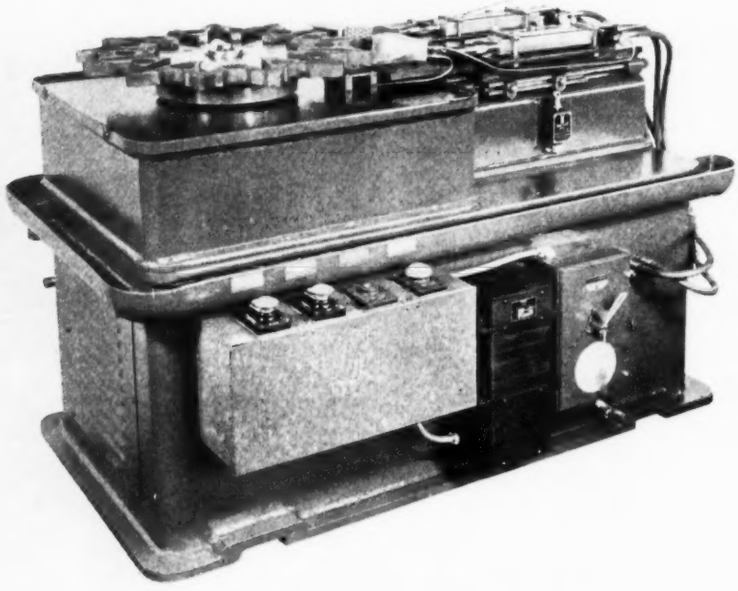
Snyder Standardized Drilling Machine Equipped for Special Hollow-milling Operations

Flame-Hardening Machine

A flame-hardening machine has just been placed on the market by Hydraulic Machinery, Inc., 10421 Grand River, Detroit, Mich. The base and external housing structures of this machine are welded steel. Electrical control and the hydraulic power unit employed for the drive provide positive and flexible operation. Parts that require adjustment and routine maintenance are located on the outside of the machine.

The pilot light, burners, and water coolant, located on the rear slide, are fully adjustable. Proper shielding serves to direct the flame and water to the specific surface to be hardened, thus assuring uniform results.

Water is used as a quenching medium, seals being provided to prevent it from entering the actuating mechanism. The part to be hardened is manually loaded on the index-table and is located by a pilot-pin. After the starting button is pressed, the mechanism automatically goes through the hardening cycle and stops. 62



Flame-hardening Machine Brought out by Hydraulic Machinery, Inc.

Snyder Standardized Drilling Machine with Special Equipment

The Snyder Tool & Engineering Co., 3400 E. Lafayette Ave., Detroit, Mich., builder of high-production, special-purpose machines, is now building a semi-standardized drilling machine that can be equipped with special tools and fixtures to handle a wide range of production work. It is claimed that one of these machines can be built and equipped to handle a specific production job at about one-half the cost of a completely special machine of equal capacity and usefulness.

The unit shown in the illustration is designated the 10 V 18 general-utility machine, and has proved very successful in many special applications. It is equipped for hollow-milling twenty bosses, using a five-spindle head. With this arrangement, the fixture is indexed four times to complete the work.

The tool-driving capacity of this machine ranges up to 15 H.P. at 1800 R.P.M. The maximum stroke is 18 inches; the minimum opening between the base and the speed-change transmission is 36 inches, and the maximum opening 56 inches. The maximum total hydraulic pressure for feeding the hydraulic slide downward is 12,000 pounds.

To obtain additional information on equipment described on this page, see lower part of page 194.

In this particular machine, the multiple head is mounted on the speed-change transmission. The oil used in the hydraulic system is contained in a reservoir mounted on top of the column. The hydraulic pump, motor, and counterweight for balancing the hand-slide and head are located inside the column.

The standard indexing mechanism provides smooth acceleration and deceleration of the Geneva wheel, which is driven by the hydraulic system of the machine. The indexing table serves as a chip trough and coolant retainer. This machine is available with or without special tooling, and with speed-change transmission for single- or multiple-spindle adaptations. Only the equipment is special, and this can be changed to meet the requirements for machining an entirely different product. The machine is also available in a size designated 20 V 16, having a maximum tool-driving capacity of 25 H.P., a 16-inch stroke, and a total hydraulic pressure capacity of 19,000 pounds. 63

Fray Horizontal-Vertical Ram Type Milling Machine

An all-purpose, horizontal-vertical, ram type milling machine particularly suited for use in toolrooms and shops in which a wide variety of operations are performed is being built by the Fray Machine Tool Co., 501 W. Windsor Road, Glendale, Calif. Practically any operation at any angle, either compound or single, can be handled by this machine, which is known as the Fray No. 9.

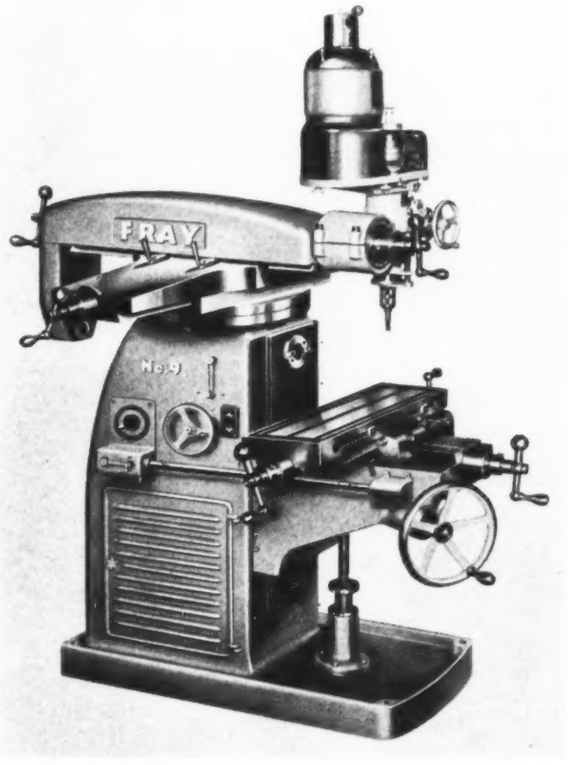
For horizontal milling, the turret head is reversed and the vertical attachment swung out of the way. When thus arranged, the machine is essentially the same as a No. 2 horizontal milling machine, and is suitable for either tool-room or production work. Milling, drilling, or boring operations can be performed at any angle, longitudinally by traversing the ram on the turret-slide, or crosswise by operating the ram in its saddle. These two movements when used in conjunction with the head, which can be set to operate at any single or compound angle, provide for a wide range of operations.

The ram has a cross travel of 10 inches and a longitudinal travel of 18 inches. The Fray Type E head is normally furnished with the No. 9 machine. The motor can be swung completely around the housing and locked in any position. Change from micrometer wheel feed to hand-lever feed can be accomplished almost instantly. The spindle is fitted with a No. 9 B & S or a No. 3 Morse taper, and has a travel of 4 inches. The horizontal spindle has a National Standard No. 40 taper.

The table has a crosswise travel of 9 inches, a longitudinal travel of 20 inches, and a vertical travel of 16 inches; the working surface is 9 1/2 by 36 inches. The motor that drives the vertical head is a Frayco 1-H.P. unit, and the horizontal spindle is driven by a 3-H.P. motor in the machine base. 64

Howe Twist-Drill Grinder

A twist-drill grinder having a capacity for using 1/16- to 1 1/4-inch drills, with provision for larger drills on special order, has been brought out by Howe & Son, Inc., Hinsdale, N. H. This is a



Fray All-purpose Ram Type Milling Machine

Twist-drill Grinder Made by Howe & Son, Inc.

To obtain additional information on equipment described on this page, see lower part of page 194.

compact. motor-driven machine designed to take a 1/2-H.P., 220-volt, or 1/3-H.P., 110-volt motor. It has two 6-inch wheels, one for drill grinding and the other for general work. There is a compartment in the base with shelves for tool storage. 65

Super-Sensitive Drill Press for Light Work

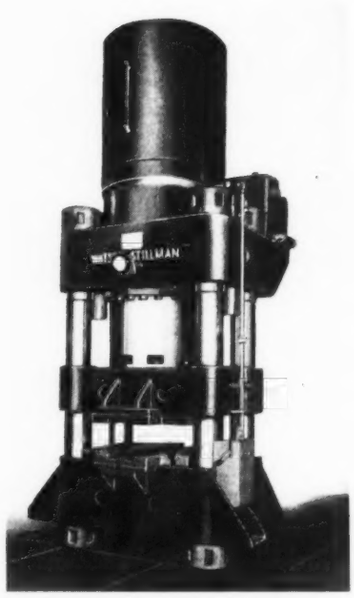
The Edward Blake Co., 634 Commonwealth Ave., Newton Centre, Mass., has just placed on the market a super-sensitive drill press designed to use extremely small drills and other small rotating tools. The machine has a standard range of eight speeds — from 3000 to 23,000 R.P.M. This covers the proper surface speeds for drills from 0.004 inch in diameter, or smaller, up to 1/16 inch in diameter. Sensitivity is obtained by balancing the spindle by means of the vertical component of the belt tension. This sensitivity, plus convenient finger-tip control, serves to reduce drill breakage to a minimum on this machine.

The machine was designed and developed by engineers familiar with the requirements of the watch- and instrument-making trades. It can be made with one, two, three, or four spindles, as required. Each spindle is furnished with a finger-tip control, and can be run independently at the speed required to suit the size and type of tool employed and the material being cut. Standard equipment includes two spindles for each spindle mount—one for a Jacobs chuck, and one with a tapered hole for tools having tapered shanks. 66

Single-Cycle Automatic Forming Press

A 1300-ton forming press which can be either automatically or manually operated is a recent product of the Watson-Stillman Co., Roselle, N. J. It is unusual among larger forming presses in its adaptability to single-cycle automatic operation or hand control, as required. The unit is entirely self-contained, including a 50-H.P. motor and a radial piston pump which has a capacity of 45 gallons per minute. The machine is controlled by a single-lever latch, operated by a pressure cylinder.

The press is of the vertical four-column type. The ram is 35 inches in diameter, exerts a pressure of 2750 pounds per square inch, and has a stroke of 22 inches. The opening capacity is 37 inches, and the clear platen area is 48 by 42 inches. Advance and return speeds are at the rate of 650 inches per minute, with a pressing speed of 10.5 inches per minute. The entire unit, occupying a floor space of 8 by 6 feet and having an overall height of 19 feet, weighs 80,000 pounds. 67

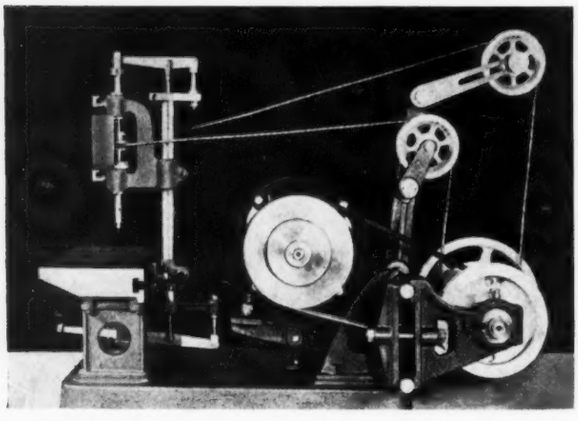


Watson-Stillman Forming Press

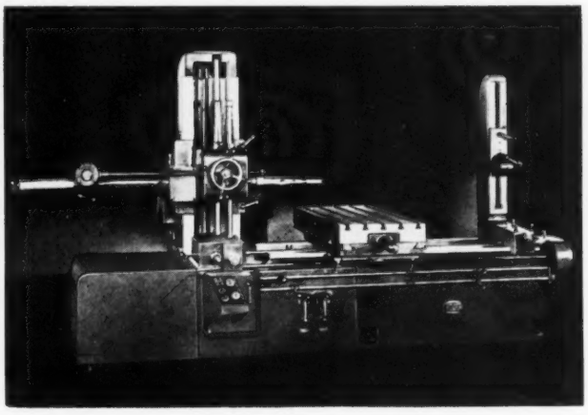
Yoder Horizontal Boring Mill

A 3A horizontal boring mill has just been brought out by the Yoder Co., 5500 Walworth Ave., Cleveland, Ohio. In this machine, the regular gear-shifting levers are replaced by a "power touch control," which can be operated by a simple touch or turn of the hand. The other controls have also been designed for easier operation. This centralized control makes available an infinite number of speeds and feeds which can be obtained without stopping to shift gears. The power flow speed change embodies high acceleration and quick dynamic stops without shock or strain.

Correct speed settings enable the positive power flow drive to attain maximum efficiency in delivering power at the point where the metal is cut. Extremely slow but positive set-up speeds for the cutters, tools, and parts permit measuring and set-up checking without completely shutting down the machine. The spindle and feed range covers a ratio of 16 to 1.



Super-sensitive Drill Press for Light Work



Yoder Boring Mill with "Power Touch Control"

To obtain additional information on equipment described on this page, see lower part of page 194.

Other features are synchronized vernier scales on the head, column, and outer support, and hand adjustment screws equipped with screw-lock micrometer dials. A two-speed rapid traverse facilitates inching the work at either a slow or a high rate. Milling cutters and other tools can be bolted directly to the flange on the outer end of the spindle. The stepless speed change provides for spindle speeds up to 600 R.P.M. and a feed of 100 inches per minute for the head, saddle, and table. 68

Smith-Johnson Air Motors

A new line of air motors, to which the trade name "Senacon" is applied, has been brought out by the Smith - Johnson Corporation, 623 E. 12th St., Los Angeles, Calif. These motors are designed for use wherever a powerful reciprocating motion is required. As an auxiliary for application to machine tools, they can be employed to save time in opening and closing valves and holding fixtures, operating clutches and latches, moving work-pieces and tools to and from each other, etc.

In these applications, the valve lever can be linked to a moving part of the machine for automatic synchronous operation, eliminating most manual motions and thus reducing operator fatigue. These air motors can also be employed as prime movers for supplying fractional horsepower for such operations as tube flaring, punching, broaching, die - casting, etc. The standard models have strokes of 1 1/2, 2 1/2, 6, and 9 inches. Other sizes, with strokes ranging from 1 to 18 inches, can be furnished on special order. 69

Hydraulic Die-Handling and Stacking Truck

A cantilever type die-handling and stacking truck having a capacity of 1000 pounds has been added to the line of the Lyon-Raymond Corporation, Greene, N. Y. The platform is 25 inches wide by 30 inches long, and has a lowered height of 8 inches and an elevated height of 62 inches. The over-all height of the truck is 94 inches. All wheels are 8 inches in diameter, and have roller bearings. A brake is provided for holding the truck in any position. The hydraulic hand-pump has two speeds.

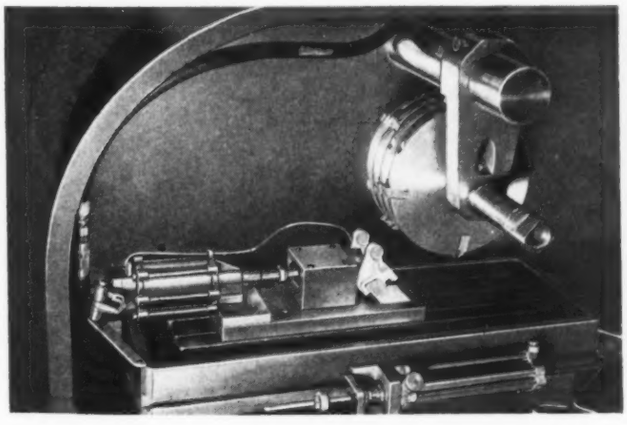
This truck can be used for lifting and stacking barrels and other materials, and for lifting skids loaded with dies, the platform alone being used in the latter case. With the platform removed and the boom attached to the carriage frame, the truck can be used as a crane for picking up dies from the floor and placing them on skids. With the boom in position on top of the frame and the platform in position on the truck carriage, the truck can be used for separating dies. This is accomplished by fastening the chains that hang from the boom to the upper half of the die and then lowering the platform. 70

Lyon Hydraulic Die-handling and Stacking Truck

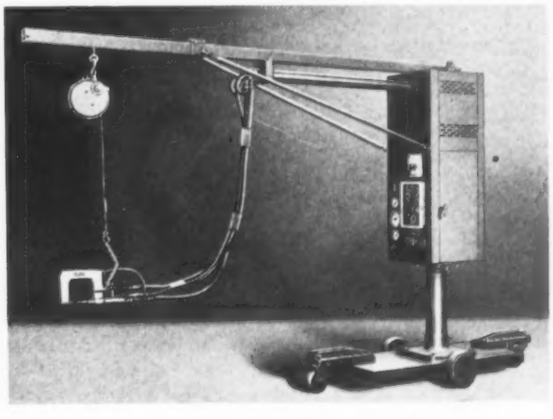
Sciaky Radial Type Spot-Welder

A P1R gun spot-welder of the radial type is being placed on the market by Sciaky Bros., 4915 W. 67th St., Chicago, Ill., in both stationary units and portable units such as the one shown in the illustration. It is equipped with a special Sciaky welding timer, and operates on single-phase alternating current of 220 or 440 volts. Hydraulic pressure is supplied by a Hydro - pneumatic booster, which has a capacity for feeding the gun at a maximum electrode pressure of 1800 pounds when operated by an air supply system that furnishes air at a pressure of 90 pounds per square inch.

Fixed or crowded jigs can be easily reached with the portable welding gun. With the stationary welding unit, welding operations can be performed within an area covered by a circle 21 feet in diameter. Under steady production conditions, this welder is capable of welding corrosion - resisting steel, pickled steel, zinc-coated steel, and



Air Motor Used to Clamp Work in Milling Fixture



Sciaky Radial Type Portable Spot-welder

To obtain additional information on equipment described on this page, see lower part of page 194.

Monel metal pieces of equal thicknesses of from 0.016 up to 0.064 inch. It will also weld two pieces of unequal thicknesses having a total welded thickness of 0.500 inch, provided that the thickness of one does not exceed 0.040 inch. 71

Tool Bit for Cutting Hard Tough Metals

A line of tool bits for machining hard tough steels and copper or aluminum alloys has recently been developed by the Black Drill Co., 5005 Euclid Ave., Cleveland, Ohio. These tool bits are made of the same metal that is used in the Hardsteel drills and reamers previously placed on the market by this company. The new metal is claimed to have many advantages when used in tool bits. It has higher shock resistance than most cast or cemented tools, minimizing breakage. High heat resistance, permitting higher cutting speeds and deeper cuts, is an important feature.

Hardsteel tool bits are adapted for use in lathes, boring mills, and shapers or planers equipped with tool-lifters. They can be used on hard or tough steels, such as the 4100 series steels, and high-chromium, high-nickel, and high-speed tool steels. They have also been used satisfactorily in machining cold-rolled and cast copper, brass, bronze, and aluminum alloys. They are especially suited for work on heavy forgings, where deep rough cuts can be made at fast speeds, but they can also be used to advantage as finishing or forming tools.

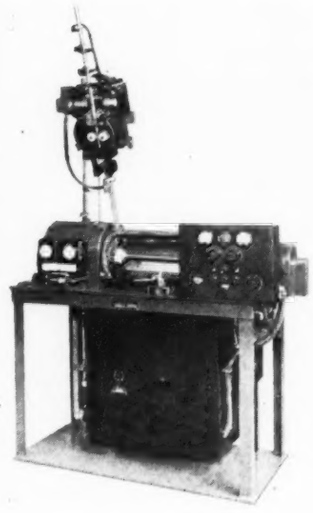
Since these bits are of solid Hardsteel, they can be reground on an ordinary wheel time after time, but as they take abuse and operate efficiently at red heat, they do not require frequent regrinding. The bits are made in square and round shapes and in all the usual sizes from 1/8 inch up. 72

Automatic Arc-Welding Equipment

Complete equipment for automatic arc welding with heavily coated electrodes in cut lengths has been placed on the market by the General Electric Co., Schenectady, N. Y. The essential elements of this equipment also have been made available, in order that automatic arc-welding heads originally designed for operation with thyratron-controlled coiled electrodes can be converted for successful welding with stick electrodes.

The equipment is particularly suited to work where one or more complete joints can be made with a single electrode, as in the welding of shells, wheels, and tubular assemblies, where the starting and finishing ends of a single weld bead overlap. It has also been used to make edge, lap, fillet, and groove welds.

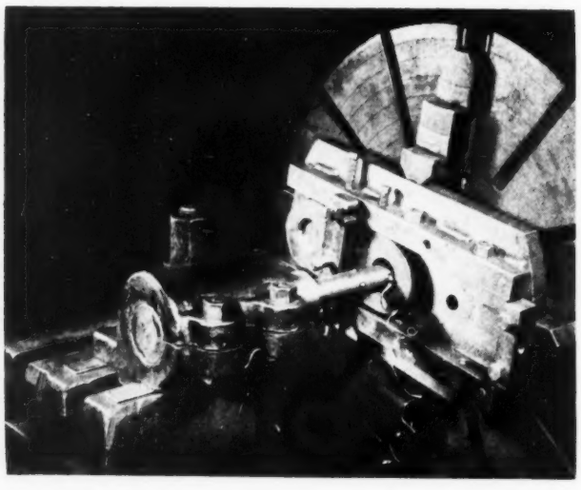
The equipment is similar to that used for welding with coiled electrodes, except for the electrode feed-rolls and electrode guiding device. The mechanism includes a clamp for holding any standard stick electrode, and for transmitting current to the electrode. The clamp is attached to the end of a feed-rod upon which two feed-rolls operate to maintain the proper arc voltage through automatic thyratron control. The electrode is accurately guided to maintain the arc in a predetermined location. Limit switches govern the movements in both directions. 73



General Electric Automatic Arc-welding Equipment Set up for Welding Float Valve

Edi Trimming Machine

A trimming machine known as the "Ideal-Cut," for use in cutting blueprints, drawings, tracing cloth,



"Hardsteel" Tool Bits Used as Fly Cutters for Boring 2 1/4-inch Hole in Hardened 3140 Nickel-chromium Steel Links for Conveyor Chain

"Ideal-Cut" Blueprint and Drawing Trimming Machine Designed to Utilize Old Razor Blades to Cut Drawings to Size

To obtain additional information on equipment described on this page, see lower part of page 194.

photographic papers, etc., to size, has been placed on the market by Edi Trimming Machines, 609 W. 115th St., New York City. The device is designed to utilize old razor blades, and can be easily manipulated. It is made in four sizes for cutting or trimming sheets from 25 to 55 inches square. 74

Producto Self-Centering Shaft Vise

The Producto Machine Co., Bridgeport, Conn., is now manufacturing a self-centering vise designed to hold spindles or shafts for such operations as cutting keyways, slotting, or splining. The vise is made for vertical or horizontal mounting on a machine table, both faces being accurately machined at right angles to each other. The work is held against a hardened V-block by the equal movement of two jaws controlled from an operating screw. This arrangement serves to accurately center work of any size within the capacity of the vise.

The vise will handle shafts or spindles 3/8 inch to 3 1/8 inches in diameter, and of any length. An adjustable stop for lengthwise location of the work is provided. The hardened V-block is made reversible to accommodate both small and large work. The base is 8 by 7 1/4 inches, and 8 by 5 1/2 inches, the V-block being 4 1/2 inches wide. The vertical center height is 5 inches, and the horizontal space 4 3/8 inches. Keys are fitted to the base for locating the vise on the machine table. The weight is approximately 80 pounds. 75

Delta Surface Grinder

A new type of surface grinder characterized by versatility, easy operation, and portability has been placed on the market by the Delta Mfg. Co., 606-L E. Vienna Ave., Milwaukee, Wis. The wheel-mounting unit of this machine has a two-piece adapter that permits either the wheel or the wheel and the adapter to be removed. This arrangement has the advantage that, once a wheel has been trued up, it can be removed and replaced without requiring any further dressing.

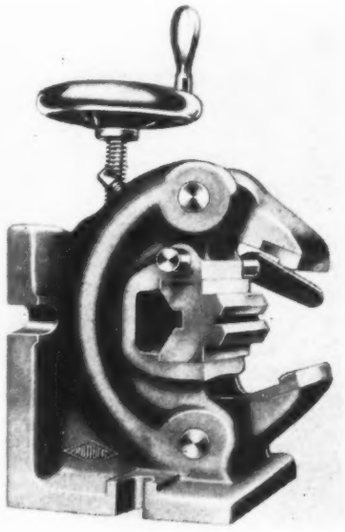
The extra long spindle, with widely spaced bearings at each end, is designed to provide permanent and true alignment, the forward bearing being a large taper bronze type which runs continuously in a bath of oil. A take-up is provided to eliminate play. The rear bearing is a sealed-for-life type that requires no lubrication. The improved table is designed with smooth operation in view, and has conveniently located control handles. The long ways prevent overhang of the table. Gibs provide adjustment for wear. The table has T-slots in it for clamping fixtures or a magnetic chuck in place. The entire column, together with the bracket, can be rotated 360 degrees.

The maximum length of work that can be ground on this machine is 13 1/2 inches, and the maximum width 6 inches. The maximum space under a 7-inch wheel, between the wheel and table, is 9 1/2 inches, and the maximum space between a wheel of this size and a B & S No. 510 magnetic chuck is 6 inches. The table is 5 3/4 by 13 inches. The traverse feed for one graduation is 0.001 inch. The maximum adjustment of the wheel by means of the micrometer graduations is 3/8 inch. Each graduation is equivalent to 0.0005 inch. The minimum diameter cup-wheel that can be used with the standard guard in place is 3 1/2 inches.....76

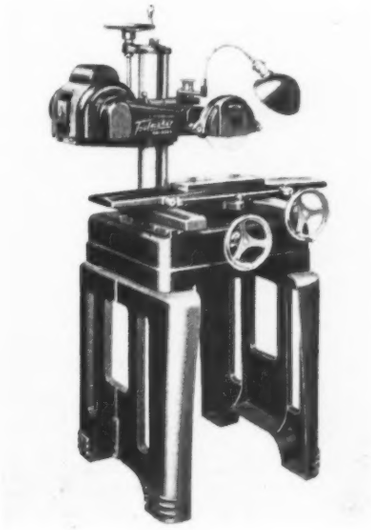
Ball Measuring Anvil for Scherr Comparitol

The George Scherr Co., Inc., 128 Lafayette St., New York City, has developed a ball measuring anvil for use on the Scherr Comparitol. This anvil is designed to speed up, simplify, and insure accuracy in the measurement of thin work. The inspection and measuring of extremely thin pieces, such as crystals, laminations, shims, small gages, and other flat work, can be accomplished rapidly and with accurate results by the use of this special ball measuring anvil. The work to be gaged is placed between the flat feeler point and the round ball surface.

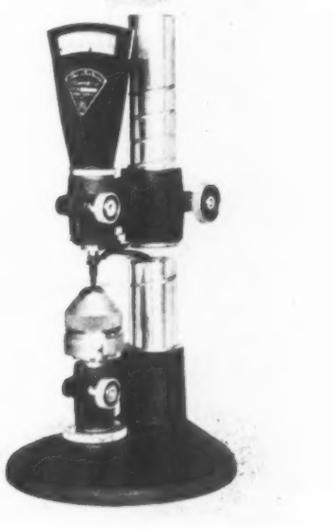
This instrument can also be used to check the flatness or paral-



Self-centering Shaft Vise made by Producto Machine Co.



Surface Grinder Placed on the Market by Delta Mfg. Co.



Scherr Comparitol Equipped with Ball Measuring Anvil

To obtain additional information on equipment described on this page, see lower part of page 194.

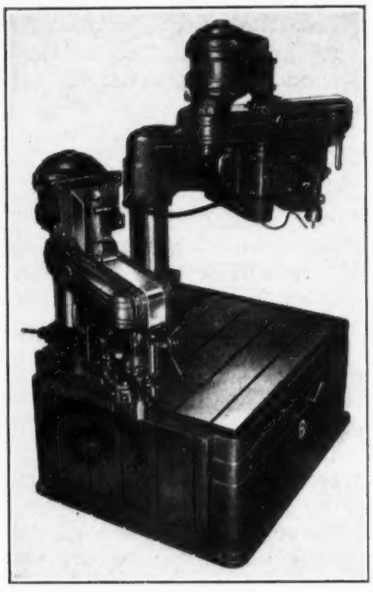
lelism of long thin pieces in all positions and on all parts of the work. The Comparitol column, when used with this ball anvil, is provided with an index line, so that the ball and feeler points can be lined up accurately from left to right with respect to center distance. 77

Skilsaw Portable Grinders

Two new portable grinders have been added to the line of electric tools manufactured by Skilsaw, Inc., 5039 Elston Ave., Chicago, Ill. These 4- and 5-inch grinders are known as Model AD and Model AE, respectively. They are designed especially to meet the requirements for high-speed grinding, wire-brushing, polishing, and buffing operations.

Ball bearings are mounted in steel inserts on the armature and extreme ends of the wheel-spindle to absorb thrust, eliminate vibration, and insure cool operation. The commutator and switch are fully enclosed for protection against dust, and straight-line ventilation serves to blow the dirt away from the operator and prevent clogging. A powerful universal motor is used to assure full grinding efficiency under load. The rubber-sleeve handle is designed to provide a firm non-slip grip.

The Model AD portable grinder is 22 inches long and weighs 15 pounds. It has a speed of 4500 R.P.M., and drives a grinding wheel 4 inches by 3/4 inch by 1/2 inch. The Model AE grinder has a wheel 5 inches in diameter by 3/4 inch thick, with a 1/2-inch spindle hole, and operates at a speed of 4200 R.P.M. This grinder weighs 18 pounds, and is 22 5/8 inches long. 78



Radial Dual-head Tapping Machine Brought out by the Bakewell Mfg. Co.

Bakewell Dual-Head Radial Tapping Machine

The Bakewell Mfg. Co., 2427 E. 14th St., Los Angeles, Calif., has brought out a dual-head radial tapping machine developed to meet the need for greater tapping production of Classes 3 and 4 gage fit threads than could be obtained on the single-head machine previously described in MACHINERY. Two tapping heads which operate independently, and their hydraulically elevated rams, are mounted on a 46- by 28-inch cast-iron table, as shown in the illustration. These tapping heads have their own driving motors, and can be equipped with different sized taps for the precision tapping of holes from No. 4-40 to 5/8 inch in steel.

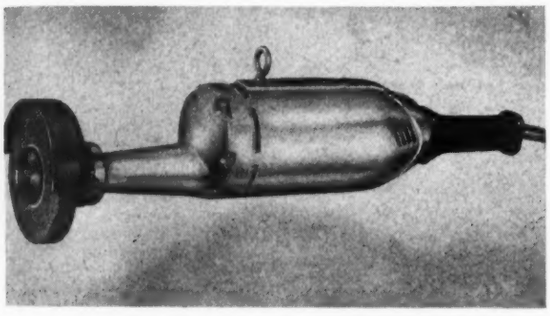
The dual-head radial machine can also be furnished with one tapping and one drilling head. Two vertical work-tables, in addition to the horizontal base, provide working surfaces for large and bulky pieces in cases where it is more advantageous to move the tap than the work. The machine can be placed beside a pit to permit handling extra long pieces, which are bolted to either the end or the rear vertical table by employing hold-down bolts in the T-slots.

Like other Bakewell precision tapping machines, the dual head employs the patented lead-screw control which feeds the tap into the work by means of a lead-screw that passes through brass guide fingers hobbed to the same pitch of thread as the lead-screw. These fingers are electrically guided by solenoid coils, and are thus pressed tightly against the threads of the lead-screw on both the up and down strokes of the tap. It is claimed that with this arrangement Classes 3 and 4 gage fits can be obtained in any material with one pass of the tap. 79

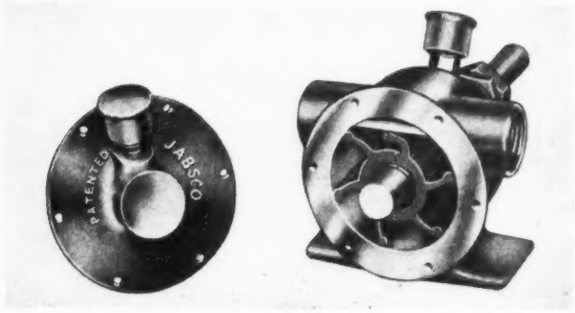
Jabsco Self-Priming Pump

A new type of self-priming pump that has but one moving part has been brought out by the Jabsco Pump Co., 8302 Wilshire Blvd., Beverly Hills, Calif. This pump is designed to handle either thick or thin coolants, and is recommended for use in pumping coolants that may become contaminated with abrasives. The pump is extremely simple in construction and operation, a single Neoprene synthetic rubber impeller being the only moving part. All other parts are made of bronze.

This pump can be easily and quickly installed on milling ma-



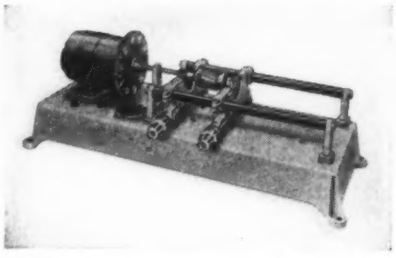
Portable Grinder Placed on the Market by Skilsaw, Inc.



Self-priming Coolant Pump Brought out by the Jabsco Pump Co.

To obtain additional information on equipment described on this page, see lower part of page 194.

chines, lathes, tapping machines, and other machine tools. It can be mounted at any angle, and can be operated in either direction. It is available in 1/4- to 3/4-inch sizes, with capacities ranging from 2 1/2 to 22 gallons per minute. This pump is being incorporated in a portable coolant unit, which is also being placed on the market. 80



Dynamic Balancing Machine Made by Bear Mfg. Co.

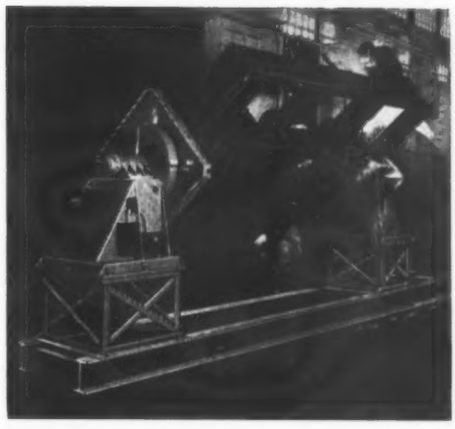
Bear Dynamic Balancing Machine

A Dynamic balancing machine, the design of which is based on a new extremely sensitive and accurate balancing principle that is said to result in a low-cost, easy-to-operate machine, has just been brought out by the Bear Mfg. Co., Industrial Division, Rock Island, Ill. This machine indicates the unbalancing centrifugal force or force couple with a high degree of accuracy, showing both the angular position and the value or amount of unbalance. In using this machine, it is unnecessary to balance the work statically before making the dynamic balancing test. The machine reveals whether static or dynamic unbalance, or both, are present without reversing the position of the work.

The machine is available in a variety of models ranging from small bench sizes up to large floor and pit type models for balancing such rotating parts as armatures, bands, blowers, flywheels, propellers, gears, pulleys, wheels, etc. The complete line of balancing machines will handle work from 6 ounces to 1000 pounds in weight. 81

Ransome Rotating Welding Fixture

A rotating welding fixture consisting of headstock and tailstock units assembled on I-beam rails for use in positioning large cumbersome objects when welding has been developed by the Industrial Division, Ransome Machinery Co., Dunellen, N. J. The headstock table top is fixed in a vertical position, and its spindle shaft turns in double Timken roller bearings. This unit is provided with power for rotating the spindle through a pinion and ring gear.



Ransome Welding Fixture for Heavy Work

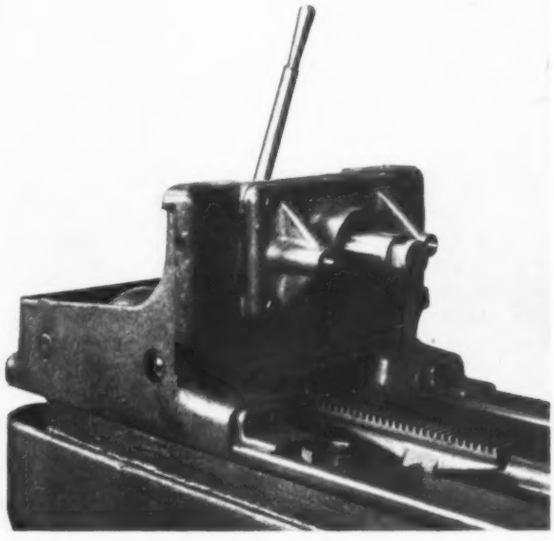
The driving motor and self-locking gear reduction are completely enclosed in the main frame. The tailstock is essentially of the same design and construction as the headstock, but is not provided with power, and functions as an outboard holding fixture. The distance between the headstock and tailstock is made variable to accommodate objects of different lengths by mounting the tailstock on heavy I-beams and moving it as required. Height adjustment is accomplished by providing simple sub-bases to suit the work. Both headstock and tailstock are of heavy all-welded construction, and the table tops have T-slots to facilitate clamping. Welding fixtures of this kind can be made in sizes to handle work weighing up to 16 tons. 82

Special Work-Holding Fixture for Landmaco Threading Machine

The Landis Machine Co., Waynesboro, Pa., has recently developed a special work-holding fixture for use with the Landmaco machine for threading operations. This fixture provides a means for accurately and rigidly supporting the work while the threading operations are being performed.

The fixture has an aligning arbor on which the work is retained by a collar that fits a square section milled close to the end of the arbor. A lever-operated cam attachment at the rear end of the arbor provides means for drawing the work onto two driving and locating pins and locking it in place.

The holding fixture is fastened to a faceplate, which is bolted to the machine carriage in place of the conventional carriage front or vise. The fixture has both horizontal and vertical adjustment on the carriage to assure accurate and permanent alignment of the work with the center of rotation of the threading unit.



Special Fixture Developed for Landmaco Threading Machine

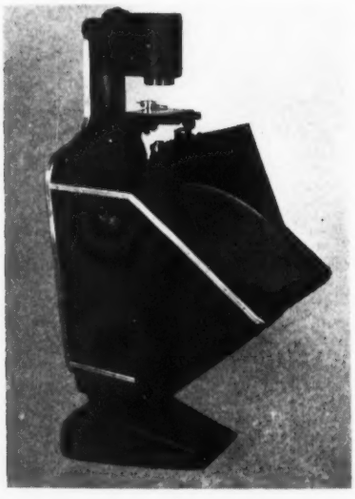
To obtain additional information on equipment described on this page, see lower part of page 194.

This fixture was designed with a view to holding work to extremely close tolerances for thread concentricity, and insuring maximum production by reducing the time ordinarily required for gripping the work in the usual vise. 83

Portman Optical Comparator

The Portman Machine Tool Co., 17 Beechwood Ave., Mount Vernon, N. Y., has recently placed on the market an optical comparator of larger size than any previously made by this company. The instrument, known as the Model P220, has several new features. The large 20-inch diameter image screen makes it possible to project an unusually large area. The fine quality lens units provide a sharply defined outline of the part over the entire 20-inch screen area. The comparator is completely equipped with a coordinate type stage, dial indicators for taking continuous readings, and surface illuminators for projecting the surface characteristics of the part. A blower system is attached to the light source assembly, which has a condenser lens that provides a soft light over the entire screen. This light operates on 110- to 120-volt alternating or direct current.

The comparator can be furnished with lens units in magnifications ranging from 10 to 100. The principal dimensions are height, 58 inches; width, 26 inches; and depth, 36 inches. The weight is approximately 400 pounds. 84



Optical Comparator Brought out by Portman Machine Tool Co.

Vernon Vertical Milling Head with Motor Drive

Vernon Vertical Milling Head

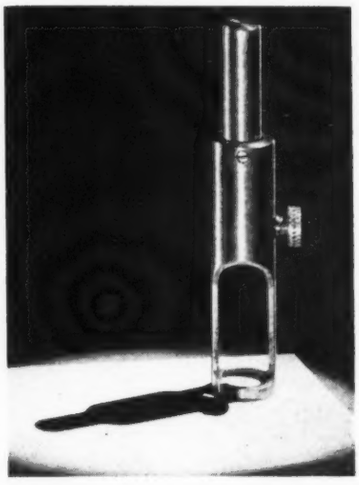
A new milling head with integral motor drive and speed reducer, especially designed for use on the Vernon No. 0 milling machine, has been placed on the market by the Machinery Mfg. Co., 1915 E. 51st St., Vernon, Los Angeles, Calif. The head is rigidly supported on the over-arm, and can be reversed to operate with the motor on either side, thus extending the range of useful table travel approximately 3 inches. Complete 360-degree rotation of the head can be made in the vertical longitudinal plane. Settings can be duplicated quickly by referring to graduated dials provided on both ends of the over-arm housing.

The transverse swivel can be rotated 25 degrees each side of the vertical position. Graduations 30 degrees each side of the zero setting are accurately cut on the spindle housing. Each angular setting of the head is securely locked by cap-screws. Squaring faces on the spindle housing are provided for vertical positioning of the spindle in both planes. Spindle speeds of 280, 525, 933, and 1750 R.P.M. are available.

The milling head is equipped with special collets for quick ejection of cutters and tools. Collets are tightened by a large nut on the spindle nose, two wrenches being furnished for the operation. Collet sizes furnished with the head are 1/4, 3/8, and 1/2 inch. Special sizes from 1/8 to 7/16 inch, varying in size by 1/16 inch, are available. Jacobs chucks and offset boring heads can be furnished with 1/2-inch straight shanks to fit the 1/2-inch collet. 85

Scope Type Centering Instrument

An entirely new type of centering and locating tool designed to accurately align the centers of layouts with the machine spindle has been brought out by the Center Master Division of the Center Scope Instrument Co., 355 S. La Brea Ave., Los Angeles, Calif. According to the manufacturer, this new center-locating instrument reduces the number of steps necessary in locating and centering the work in alignment with the spindle axis. It is said to increase the accuracy, because it compensates for any run-out of the spindle and adapter, and it is easier for the operator to center his work-lines between the scribed lines on the locating glass of the instrument. The center scope is of simple construction, yet accurate and easy to apply. The over-all length is 3 1/4 inches. 86

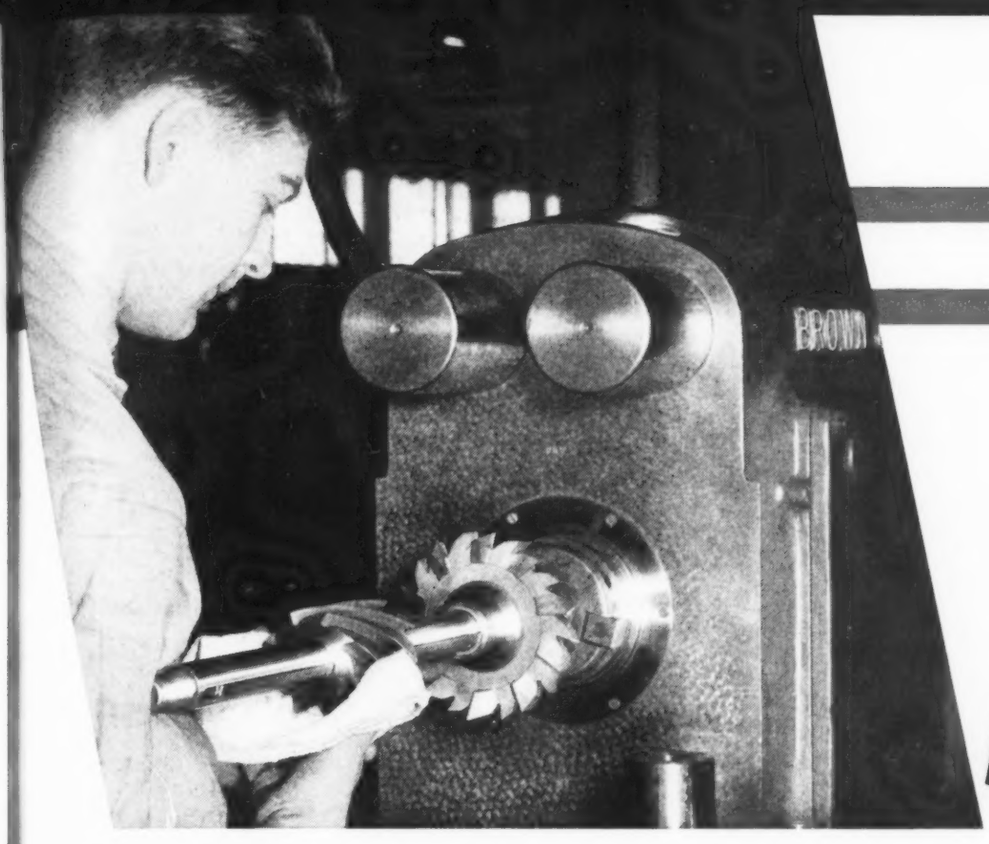


Scope Type Centering Instrument for Use in Milling Machine Set-up Work

Lincoln Electrode for "Fleet-Fillet" Welding

An arc-welding electrode designed to add still more speed to arc-welding operations has been

To obtain additional information on equipment described on this page, see lower part of page 194.



. . . GET MORE OUT OF YOUR CUTTERS

Cutters must do a greater day's work than ever before. Only a limited supply is available to serve the demands of increasing production.

You can help by using more care than usual with your cutters. By following the suggestions here to get the utmost production from the cutters you use, you can help to do your share in our united war effort.

✓CHECK THESE POINTS

Chatter is a serious cause of poor finish, and damage to cutters. Too much tooth clearance and lack of rigidity of the machine or cutter drive are contributing factors causing chatter.

Mount cutter as close as practicable to the spindle.

With small cutters (such as end mills) be sure to run at the same surface feet as required for larger cutters.

Handle cutters carefully. Prevent damage to the cutting edges.

Watch cutters for wear. When dulling becomes excessive, too much metal is removed in the sharpening process. On a production job, sharpen the cutters after a predetermined number of cuts regardless of wear.

✓CHECK THE MACHINE Be sure machine is heavy enough to stand the cut — and in good condition • Use the *correct* spindle speeds with each setup • If coolant is needed, use enough.

✓CHECK THE ARBOR Use arbors of ample diameter • Insert shanks of arbors carefully in thoroughly-cleaned taper holes • Be sure ends of collars are not bruised • Provide adequate arbor support.

✓CHECK THE WORK Have the work clamped and supported properly • Work not rigidly held can cause premature cutter wear or even breakage.

Help the war effort—get the utmost in productivity and service from these critically needed cutting tools.

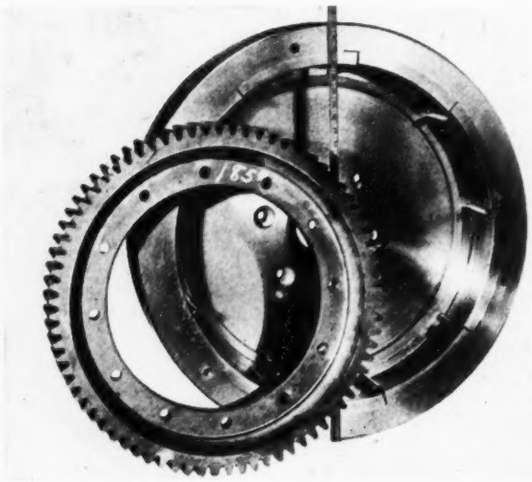
E
We are proud to be honored with the Navy "E", awarded for outstanding accomplishment in Defense production.
Brown & Sharpe Mfg. Co.
Providence, R. I., U. S. A.
IBS

Reprints of this advertisement for use on your bulletin board furnished on request.

BROWN & SHARPE CUTTERS

added to the line of the Lincoln Electric Co., Cleveland, Ohio. The new electrode — the "Fleetweld 11"—is created expressly for use with the Fleet-Fillet method of arc welding, recently announced by the company. The electrode is designed to obtain maximum welding speed by the application of the new welding technique.

This electrode is fast flowing, but gives deeper penetration of metal to the root of the joint, and is of the Shielded-arc type, heavily coated to exclude oxides and nitrides from the weld. The electrode is designed to complete a weld in one pass. It is made in sizes of 3/16 and 1/4 inch diameter by 18 inches long, and is packed in 50-pound cans. 87



"Speed-Chuck" for Gears, Developed by Charles Cotta

S. Broadway, Los Angeles, Calif., has been brought out to meet these requirements. Although designed primarily to speed up production on difficult riveting jobs, tests have shown that these rivets will hold as high a pressure as a conventional rivet, due to the uniformity of head formation, shank expansion, and the clinching action secured by Cherry riveting.

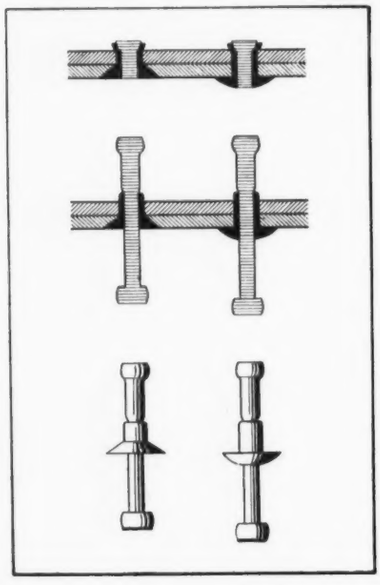
Standard drilling and dimpling tools are used to apply these rivets. The only special tool required is the gun, which is used to pull the stem or mandrel with sufficient force to head the rivet on the blind side and then break the stem. As the mandrel is pulled through the rivet, a tulip-shaped head is formed on the blind side and the pieces being riveted are securely clinched together. 88

when it is rotated in the normal direction for performing the machining operations. The gear is released by a slight turn in the opposite direction.

With the "Speed-Chuck," accurate alignment is automatically obtained because the pins are accurately sized to make contact with the teeth on the pitch line and the cams carefully ground to assure concentricity. Each chuck is especially designed and built for the job for which it is to be used; thus, it is primarily a production tool. Various types are available for single or cluster gears, and they can be furnished in sizes for holding gears ranging from 3 to 36 inches in diameter. 89

Cherry Blind Rivets

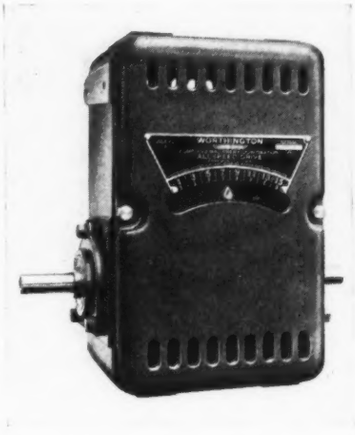
In the manufacture of planes for high-altitude flying, it is necessary to employ rivets in the construction of pressure cabins that not only have the normal structural strength, but that must also be capable of withstanding considerable pressure. The line of "Cherry" blind rivets announced to the trade by the Dana Jones Co., 756



Cherry Brazier and Countersunk Rivets before and after Application

Cotta "Speed-Chuck" Designed to Grip Gears at the Pitch Line

The Cotta "Speed-Chuck," developed by Charles Cotta, 1712 Harlem Ave., Rockford, Ill., is designed to hold spur or helical gears for hub, hole, or face grinding, and similar operations. Loading and unloading time is reduced to a minimum, since the gear is simply set into the chuck, after which a slight turn causes it to be gripped firmly by a set of hardened and ground pins that come in contact with the gear teeth on the pitch line. These pins bear against a set of accurately ground eccentric cams, which are so positioned that they tighten their grip on the gear



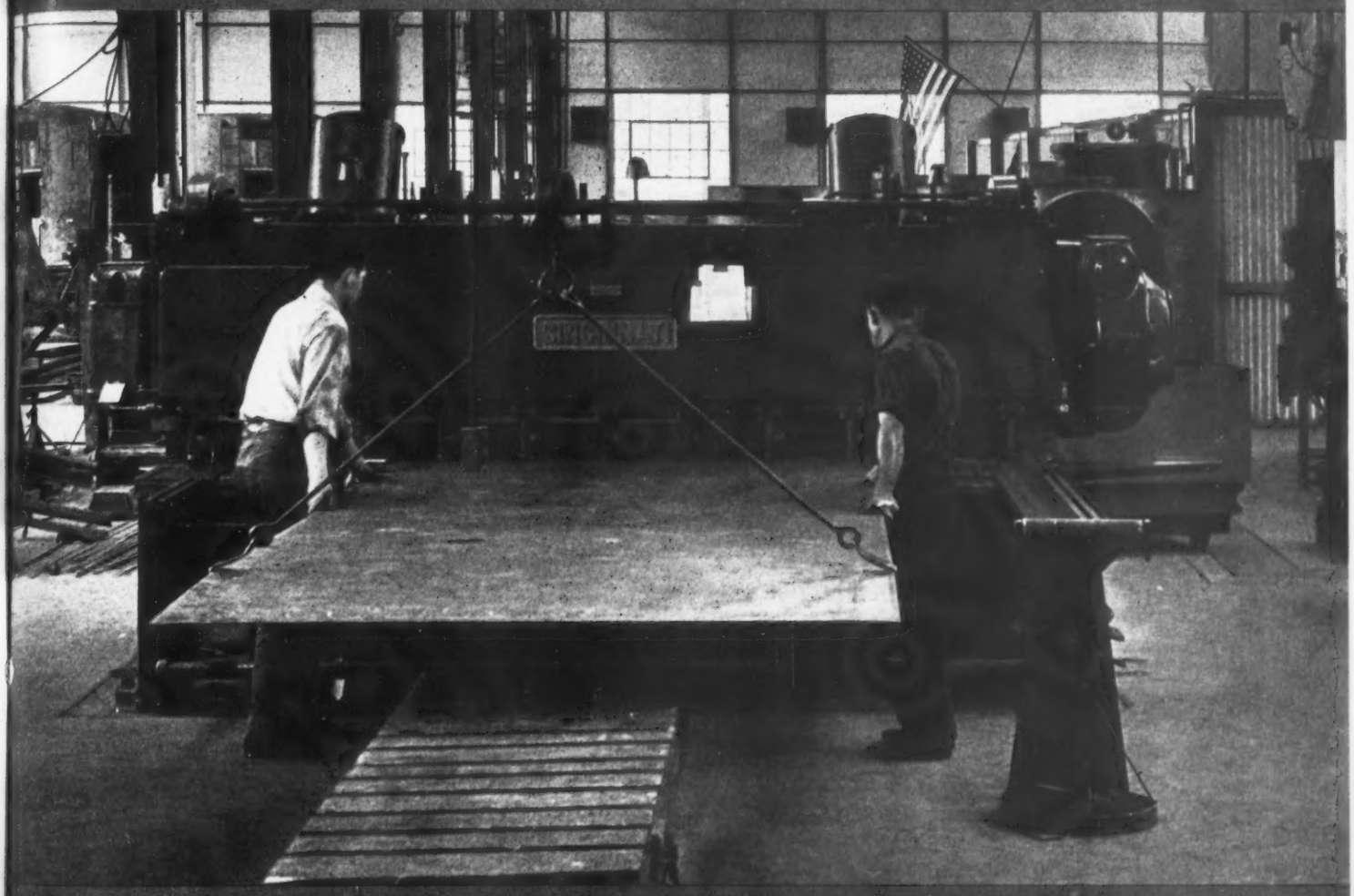
Variable-speed Drive Made by Worthington Pump & Machinery Corporation

Worthington Variable-Speed Drive

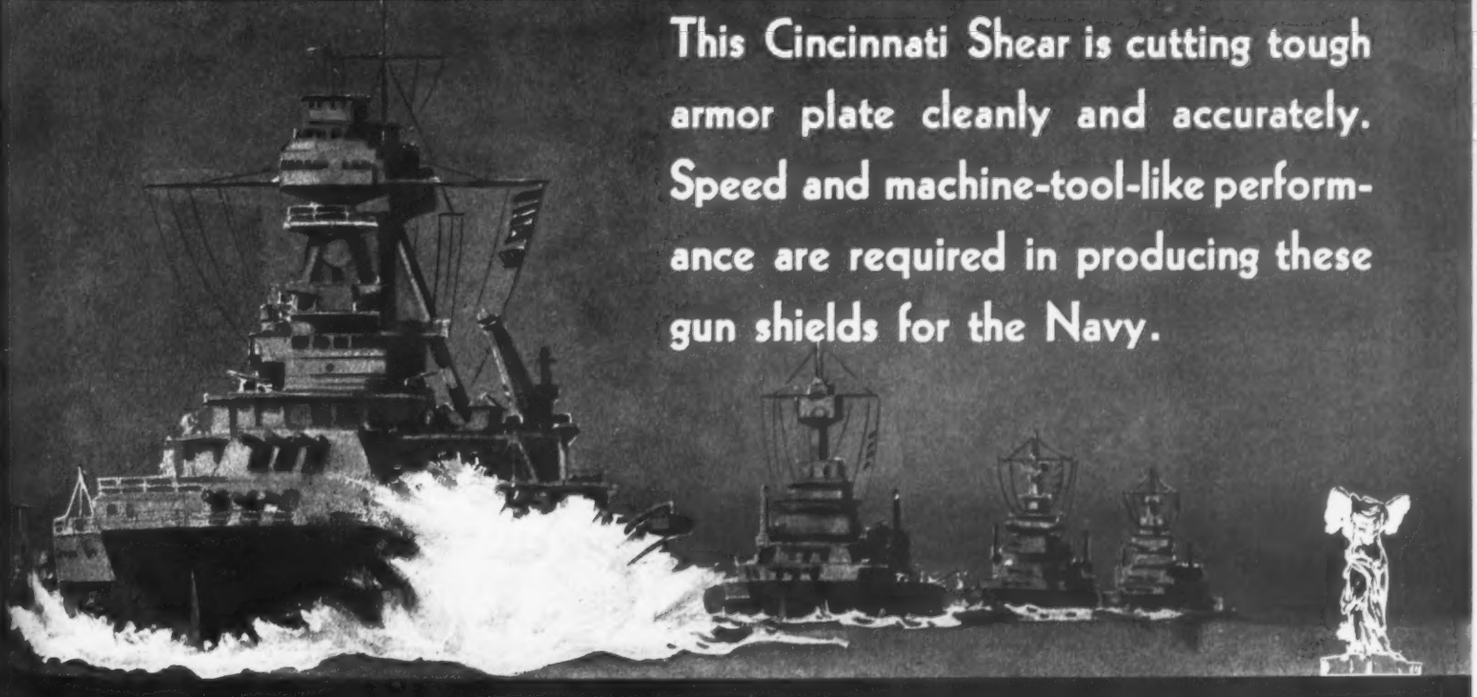
A variable-speed, multiple V-belt drive, designated "Allspeed," is a new product of the Worthington Pump & Machinery Corporation, Harrison, N. J. The first of these drives to be placed on the market is the Model A, which has a range of 1/3 to 3/4 H.P. A speed ratio of 16 to 1 gives any speed from one-eighth to twice the driving motor speed. This drive is of compact design, ball-bearing equipped, and can be operated in any position. It can be directly coupled to

To obtain additional information on equipment described on this page, see lower part of page 194.

★ GUN SHIELDS FOR THE NAVY



This Cincinnati Shear is cutting tough armor plate cleanly and accurately. Speed and machine-tool-like performance are required in producing these gun shields for the Navy.



THE CINCINNATI SHAPER CO.

SHAPERS • SHEARS • BRAKES

CINCINNATI, OHIO

any standard motor, and the output shaft can be run at motor speed.

An interesting feature is the mechanical positive belt-tensioning device, which automatically compensates for increased arc of belt contact, caused by changing from low to high speeds, without the use of springs. The drive need not be dismantled to change belts. It is also being developed in sizes ranging from 1 to 10 H.P. While originally intended for application to machine tools, this drive is also being successfully used on other types of equipment. 90

Fig. 1. Knu-Vise Clamp for Holding L-sections

Knu-Vise Work-Holding Clamps

Knu-Vise, Inc., 16841 Hamilton Ave., Detroit, Mich., has developed several new work-holding clamps, one of which is shown in Fig. 1. This clamp is designed to hold L-sections, such as are used in aircraft construction. The L-clamp is adapted for use in limited spaces where a large throat capacity is necessary. The clamp can be put in any position, rubber caps on the contact surfaces preventing marring of polished surfaces.

Another new development announced by this company is a clamp with a U-shaped toggle bar, the handle being arranged in line as shown in Fig. 2. This clamp permits the simultaneous gripping of small parts, regardless of their thickness. The slotted toggle bar allows horizontal movement of the two rubber-capped spindles for positioning over the work. Once adjusted for a given job, these spindles remain in their respective positions until the work is completed. A uniform pressure is exerted by this clamp.

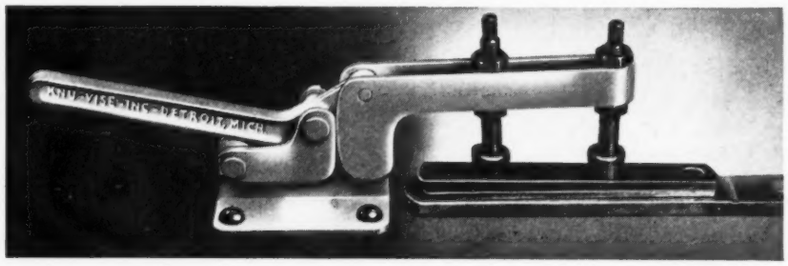


Fig. 2. Knu-Vise Clamp with U-shaped Toggle Bar

Parallel clamping pliers are still another new product of this company. The extended parallel jaws have two spindles which can be adjusted to permit the application of evenly distributed clamping pressure over a large area. This feature is advantageous in gluing operations on plywood. 91

Rouse Hand Miller

A light-weight hand miller, designed to sell in the low price range, has been developed by H. B. Rouse & Co., 2214 N. Wayne Ave., Chicago, Ill. This is a high-speed, ball-bearing, motor-driven bench machine, which is suitable for taking light cuts on brass, aluminum, etc.

It can be used advantageously on small parts for radios, electric motors, airplanes, etc. Special fixtures developed for each particular piece can be had for high-production work. Either small circular milling cutters or small end-mills can be used. 92

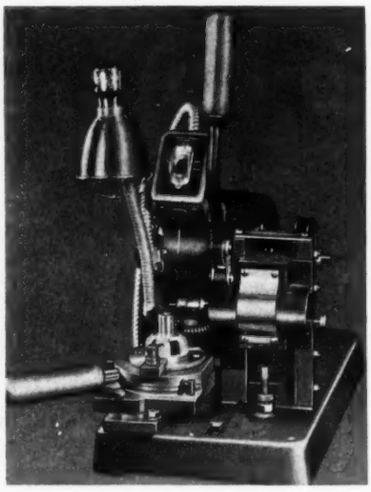
Slide-Rule for Standard Nut Dimensions

A slide chart, known as "Elemoto," which gives American standard dimensions and data for all sizes of elementary parts, such as nuts, bolts, plain washers, lockwashers, Woodruff keys, pipe threads, and sizes of tap drills, has been brought out by the Elemoto Sales Co., Teaneck, N. J. The desired specifications can be quickly obtained with one movement of the slide, which operates on a simple slide-rule principle. Dimensions of countersunk, fillister, round, and hexagonal heads are given.

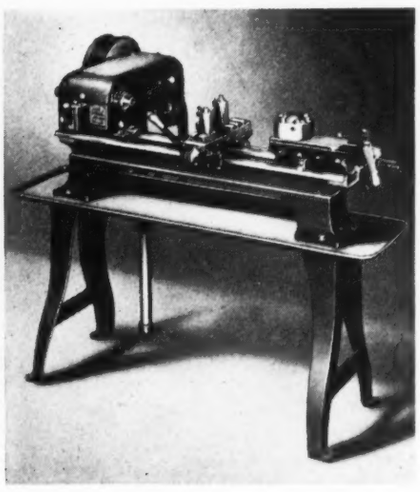
The slide also has convenient tabulations of decimal equivalents, sheet, plate and twist-drill gages, and conversion tables for millimeters and inches. 93

Logan Turret Lathe

The Logan Engineering Co., 4901 Lawrence Ave., Chicago, Ill., is announcing to the trade a No. 830



Rouse Light-weight Hand Miller



Logan Turret-equipped Hand Screw Machine

To obtain additional information on equipment described on this page, see lower part of page 194.

1938

37,000
MAN HOURS PER MONTH

133,000 SQ. FT. OF FLOOR SPACE

1942

266,000 SQ. FT. OF FLOOR SPACE

214,000
MAN HRS. PER MONTH

On September 10, 1942, The Cincinnati Bickford Tool Company received its greatest honor, the Army-Navy "E" award for excellence in production. In accepting this award each employee realizes that it carries with it the obligation to maintain our high standards and continually strive for greater production and more efficient metal drilling machines.

THE CINCINNATI BICKFORD TOOL CO.

OAKLEY CINCINNATI OHIO U. S. A.

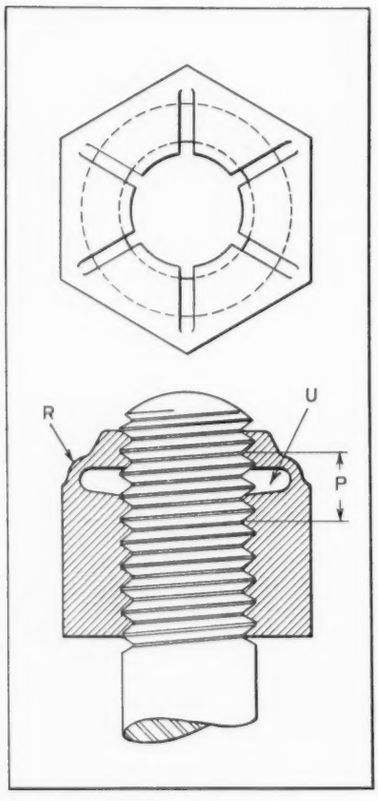
hand screw machine, which has a capacity for machining 5/8-inch round bar stock. This new lathe was developed to meet current-day needs for a small machine capable of accurate and continuous production. It has a precision-ground bed with two prismatic V-ways and two flat ways; a precision, preloaded, ball-bearing spindle mounting; turret holes bored from the headstock; and turret and cross-slide provided with gibs to compensate for wear. A new speed collet chuck for handling round work which can be fed through the spindle, and a bar feed attachment are offered as accessories. 94

Self-Locking Nut

A self-locking nut having a body section of standard proportions has been developed by Edward F. Chandler, 148 Richmond St., Brooklyn, N. Y. With this design, there is no reduction in the thread-bearing surface. The illustration shows the nut design in section on a bolt. The crown or extended portion of the upper part of the nut can be made to correspond in height to a lock-nut of the type commonly employed.

In producing the nut, the blank is drilled and threaded in the normal manner — that is, a straight thread is tapped entirely through the nut. The under-cut or channel *U* may be formed either before or after threading. At this stage, the nut is subjected to an operation on a press whereby the crowned portion at *R* is set downward a slight amount to reduce the distance *P* below that of the normal dimension. This deformation need be only slightly greater than that required to absorb the axial play between the commercial bolt and nut dimensions.

When the nut is applied to the bolt, it can be easily and quickly turned until the bolt end reaches the thread in the crowned portion. Then, as the rotation of the nut continues, the bolt thread, acting as a cam, crowds this portion of the thread upward in an effort to restore dimension *P* to the normal size. As a result of this action, substantially all axial play is eliminated, and the nut is caused to tightly grip the bolt thread axially —that is, the jaws of the castellated crown are not depended upon to grip the bolt in the usual manner. The frictional engagement, which maintains a constant pressure on the load-carrying sides of the threads, affords the self-locking feature. The nut is self-contained and reusable. 95



Cross-section of Self-locking Nut Developed by Edward F. Chandler

An Unusual Application for Silver

Now that copper production can barely keep pace with defense needs, the use of silver in bus-bars is suggested by the American Silver Producers' Research Project. If Government-owned power plants, or even those of private companies, replaced copper bus-bars with those made of silver, thousands of tons of high-purity copper could be released for defense applications. The silver presumably would come from reserves now idle in Government vaults or from newly mined silver which the Government is constantly purchasing from domestic producers. It might be lent and returned later when needs for copper are less pressing.

Silver is the best electrical conductor known, and has other excellent physical properties that make it suitable for use in bus-bars. It is easily fabricated, and can be silver-soldered or brazed with silver alloys in the same way that copper bus-bars are brazed. Even today, silver is being used in place of copper, brass, and stainless steel by many manufacturers who cannot obtain these metals for non-defense requirements. Such uses appear certain to increase, since sufficient silver is available. The articles produced from silver have high intrinsic value, and can always be converted into cash when obsolete.

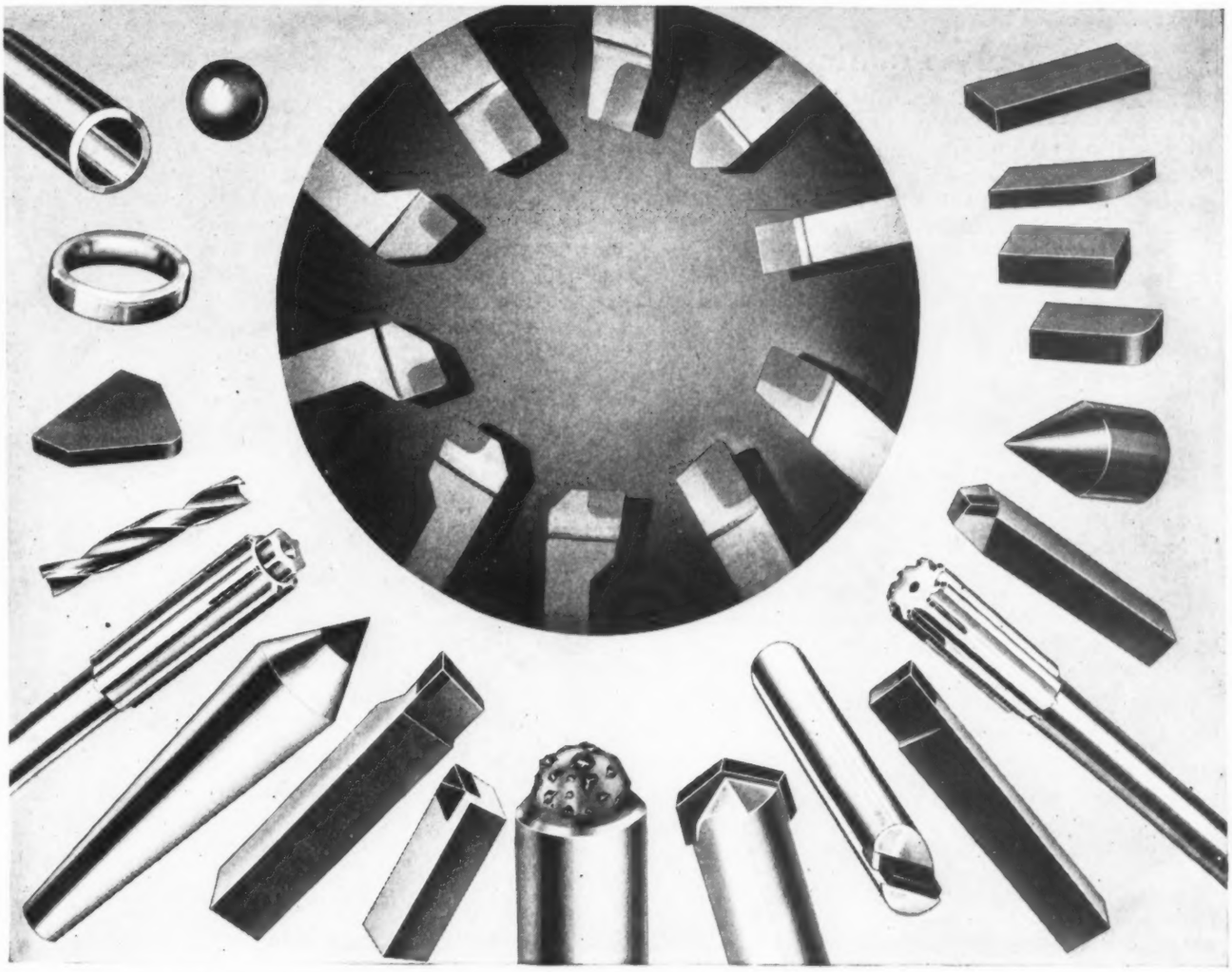
Redesign of Forged Parts Results in 40 Per Cent Increase in Machining Output

The importance of designs carefully planned to make machining convenient and rapid is exemplified by an experience of the Gardner-Denver Co., in the production of crankshafts and connecting-rods from forgings. This company redesigned the forgings used for these purposes. The manufacturer states that, as a result of this redesigning, "the rate of machining and finishing forged crankshafts and connecting-rods was increased by 40 per cent."

It was, of course, clearly recognized that redesigning the forged parts was not in itself a sufficient guarantee of increased production. In addition, it was necessary to take every precaution to maintain the forging dies in first-class condition, and thus prevent losses that tend to slow up production.

Furthermore, the machining and finishing operations could not have been performed at as rapid a rate as they were had it not been for the uniformity of the physical properties obtainable in the forgings by heat-treatment.

To obtain additional information on equipment described on this page, see lower part of page 194.



ANNOUNCING—NEW, STOCK-TOOLS AND BLANKS *plus* NEW, TIME-SAVING STANDARDIZED DESIGNS!

Carboloy Company now makes available (effective Sept. 8) a large number of additional *STANDARDIZED* tools and blanks, to supplement its present standard boring, facing and turning line.

These newly standardized tools and blanks fall into two classifications as follows:

1. Standard *STOCK*. Standard stock items are those manufactured in mass production and maintained in stock for immediate requirements. With the additional standards established, over 200 separate items are now in this standard stock classification.

2. Standardized Designs. Standardized-design items, in general, are former special tool styles for which there previously has been a large demand *within a narrow range of minor design variations.* Standard designs for these have been established to broadly meet most previous requirements. You can now order these items simply by tool number and eliminate considerable time for drafting, blueprints, quotations, detailed ordering etc. Standardized design items will be added to stock as demand justifies.

A new 28-page general tool catalog, No. GT-142, contains complete prices and specifications. Copies on request.

← *Send for Free Catalog NOW!*

Chicago • Cleveland
Los Angeles • Newark • Philadelphia
Pittsburgh • Seattle

CARBOLOY COMPANY, INC.
11147 E. 8 MILE AVE., DETROIT, MICHIGAN

Canadian Distributor:
Canadian General Electric Co., Ltd.
Toronto, Canada

CARBOLOY Reg. U.S. Pat. Off.
CEMENTED
TOOLS - DIES - DRESSERS
CORE BITS - MASONRY DRILLS
- WEAR RESISTANT PARTS -
CARBIDES

FOR THE MANUFACTURING · MINING · TRANSPORTATION · CONSTRUCTION INDUSTRIES

Victory Training Film Program to be Extended

The remarkable results obtained with the vocational training films of the United States Office of Education, Federal Security Agency, in speeding up the training of war-industry workers have caused the Government to extend and greatly enlarge its Victory Training Film program, and 140 new motion pictures are now being made for this purpose.

The object of these films is to accelerate the process of training new workers in the technical and semi-technical phases of war production. The forty-eight films previously issued by the Office of Education related to basic plant operations, such as precision measurement, bench work, the use of milling machines, cutting tools, and various other machine work. Ten of the films were on shipbuilding operations. The films now in circulation are being used by leading universities, such as Purdue, Tulane, Notre Dame, Kansas, and Maryland. Numerous trade and vocational schools, the Army, Navy, and Coast Guard, arsenals, foundries, and munitions plants, shipyards and Navy Yards, tank and airplane manufacturers, steel and aluminum plants, and many other industrial establishments are also making use of these films. Requests for the training pictures have been received from Great Britain, Canada, Australia, India, South Africa, and Mexico. The films are being distributed by Castle Films, Inc., of New York City.

Welding Machines and Booths Arranged for Training Welders at the Twin City Plant of the Ford Motor Co. at St. Paul, Minn. (Photograph Courtesy of Lincoln Electric Co.)

Silver Used for Aircraft Engine Bearings

Silver-lined bearings are now being used effectively in aircraft engines of the radial air-cooled type, and also in engines designed for liquid cooling, according to information recently released by the American Silver Producers' Research Project. Some of the bearings are complete rings coated inside and outside with silver, and some are split and coated on the inside surface only. Silver is understood to be capable of carrying a higher load than babbitt, is a better conductor of heat, and retains its hardness at temperatures above those feasible with babbitt.

The coatings are generally applied by electroplating, although it is possible that other methods of application have been found suitable. Subsequent to application, the silver is machined to the close limits required in aircraft work. Silver removed in machining, and that applied on bearings which may be rejected for minor defects, is easily reclaimed. All coatings of pure silver have high corrosion resistance.

* * *

Grinding Rifle Drills

Deep-hole drills, like those used in drilling rifle barrels, must be accurately ground to a certain predetermined shape if they are to give good results. At the present time, information on the correct grinding of rifle drills is of especial importance. In order to make such information available, the W. F. & John Barnes Co., Rockford, Ill., has brought out a clearly illustrated booklet entitled "A Practical Guide for Grinding Rifle Drills," which gives exact directions for grinding such drills.

* * *

According to figures compiled by the American Gear Manufacturers Association, industrial gear sales for August, 1942, were 38 per cent above those for August, 1941, and over 10 per cent above the sales for July, 1942. The eight months ending with August, 1942, are about 33 per cent above the corresponding period of 1941. This applies to industrial gears only.

HERE COMES THE "DOCTOR OF BALANCE"!

A portable unit which answers the need for balancing large rotating parts under actual operating conditions.

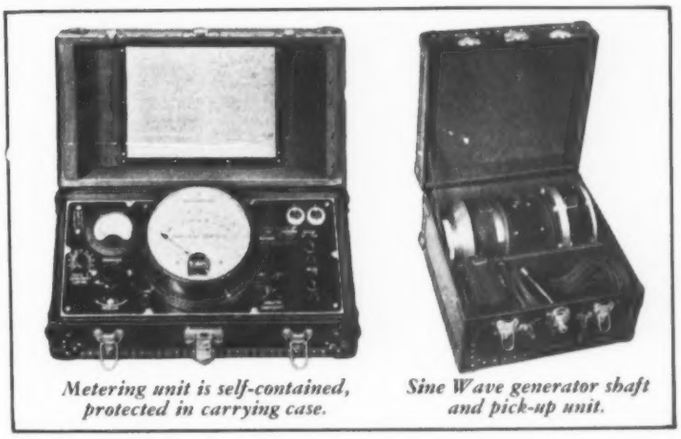
PORTABLE WATTMETER TYPE BALANCING MACHINE

Product of The Westinghouse Research Laboratories

NOW, in two convenient carrying cases, you can bring the balancing equipment to the machine . . . to locate, measure, and correct unbalance in rotating parts at their rated speeds . . . on their own bearings . . . under actual working conditions.

Using a simplified balancing procedure known as the "Wattmeter" method, this unit records both amplitude and phase angle of vibration, enabling you to determine the points of unbalance and corrective weights needed. Available for balancing parts operating at speeds between 100 and 10,000 RPM.

Not to be considered a production machine with other Gisholt Balancing equipment, the Portable Unit is recommended for use in checking proper balance at the time of installation and for maintenance of large rotating parts of special design made in small lots. Literature on request.



Metering unit is self-contained, protected in carrying case.

Sine Wave generator shaft and pick-up unit.

GISHOLT MACHINE COMPANY, 1209 East Washington Avenue • Madison, Wisconsin

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

Planer with Reciprocating Tool-Head

Truck frames and other locomotive parts having projecting members that would interfere with their being machined on planers of conventional design are handled at the plant of the American Locomotive Co. in Schenectady, N. Y., by the Betts cross-stroke planer shown in the accompanying illustration, although the job seen on the planer table consists of a die-block that could be machined just as readily on planers of the regular type. This cross-stroke planer is so constructed that the tool reciprocates across the table while the table is fed longitudinally in small increments along the bed to carry the work gradually past the path of the tool.

Reciprocation of the saddle on which the tool ram is mounted is effected through the engagement of a motor-driven pinion with a rack that extends practically the full length of the cross-rail. The tool ram is mounted on a slide which can be adjusted on a short rail that extends at right angles to the face of the cross-slide. Thus, the tool-slide can be adjusted in relation to the cross-rail by applying a crank-handle to a short lead-screw. The table is 20 feet long by 9 feet wide, and the distance between the housings of the planer is 11 feet.

* * *

Increasing Use of Airplanes after the War

A large number of small planes will doubtless be produced after the war, so that a new era of civilian flying can be expected, especially with the thousands of army- and navy-trained pilots who will want low-cost aircraft of their own. The rapid strides made in the building of warplanes have been made possible only under war emergencies, where speed has been so urgent. The mass-production methods will carry over to peacetime, so that we may expect the air to rival the road as a means of travel.—*Frank W. Curtis, Past-President of the American Society of Tool Engineers*

* * *

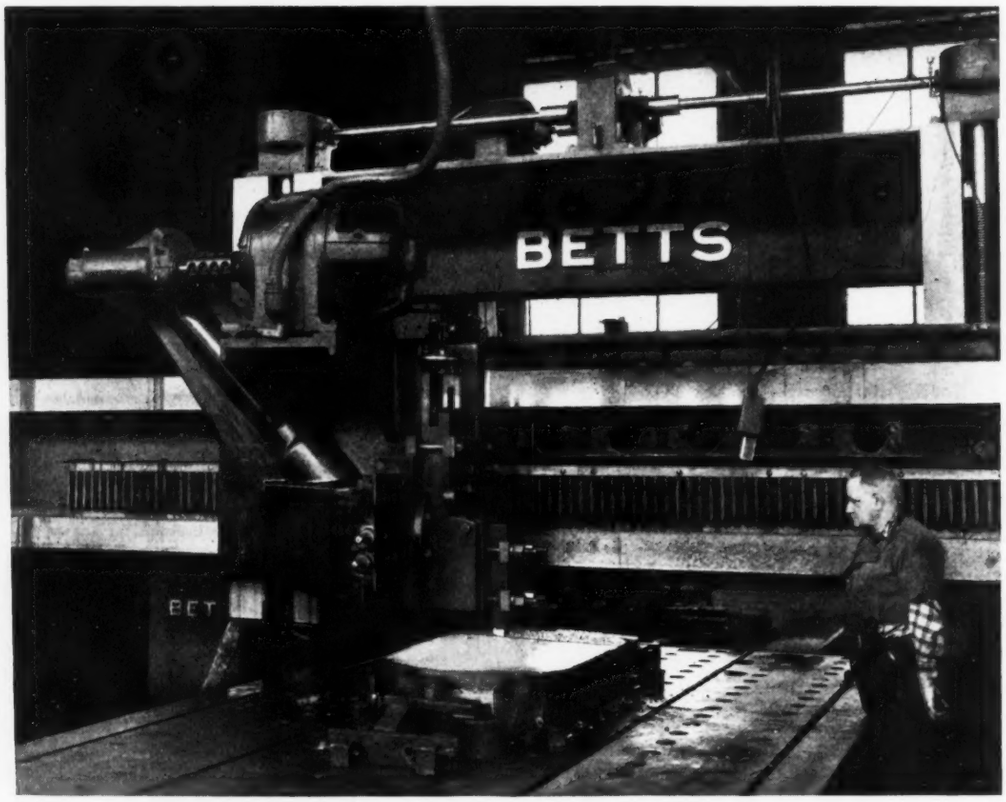
Prize Award in Compressed Air Institute Competition

In the recent competition sponsored by the Compressed Air Institute, 2700 Terminal Tower, Cleveland, Ohio, the first prize of $200 was awarded to A. W. Lancaster of Orillia, Ontario, for a description of an application of compressed air that increased the speed of producing cartridge cases five-fold.

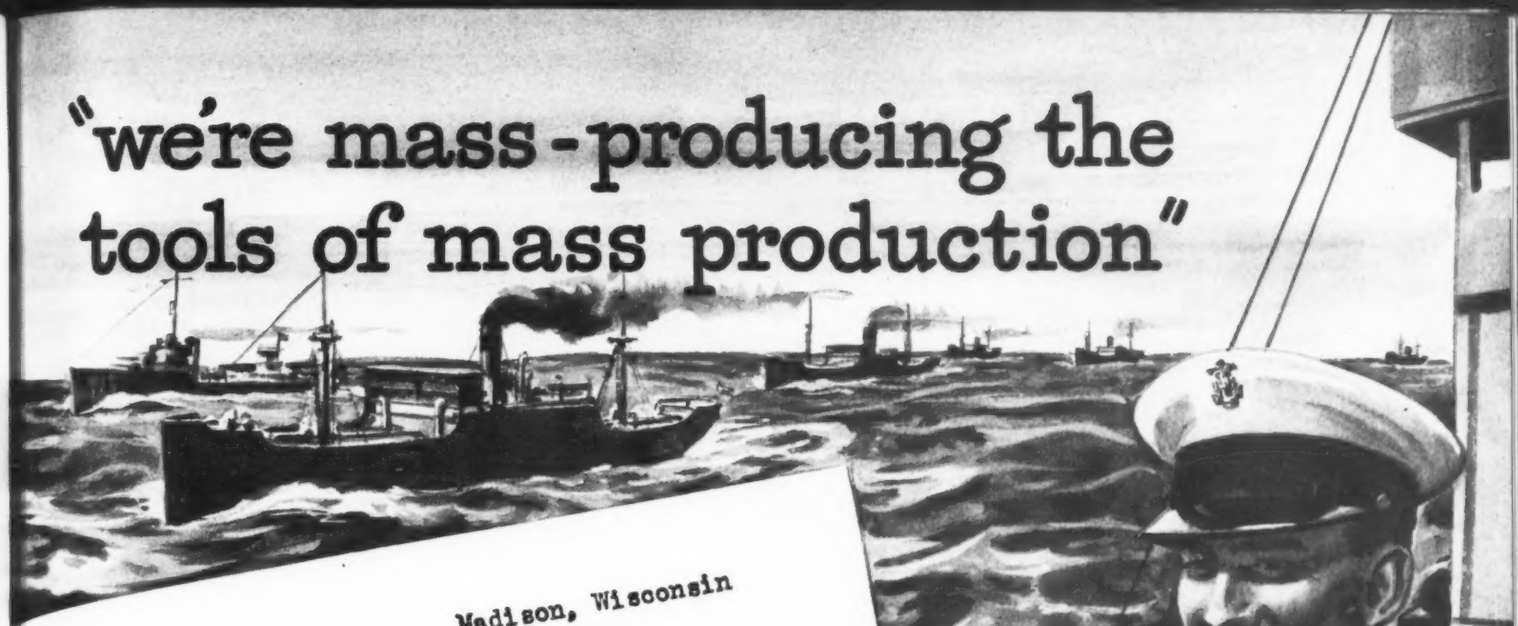
* * *

The American Engineering Co., Philadelphia, Pa., has just completed a standardization program on sixteen sizes of the Hele-Shaw fluid power pumps. This standardization affects pumps in both the low- and high-pressure ranges.

Planer of Such Construction that the Tool Reciprocates across the Face of the Rail while the Table Feeds through the Machine in Small Increments past the Path of the Tool



"we're mass-producing the tools of mass production"



Madison, Wisconsin

Dear "Admiral":

Perhaps out there at sea you often wonder what we're doing back home. Wish you could see for yourself. You'd hardly know the old place.

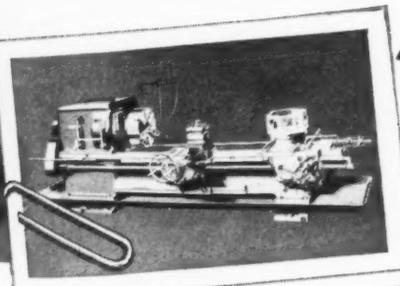
It would do your heart good to see our production line for the new "Victory" lathes. Here's a good example of the way American engineers can meet an emergency like this! Actually, you could say that we're mass-producing the tools of mass production! We're building these big turret lathes 15 times faster than our former peak capacity in these sizes!

How'd we manage to do it? Maybe the censors wouldn't like to have us put the whole story in writing. But take our word for it, there'll be no "aid and comfort" for the enemy in the number of them that are going to work in vital war plants!

One thing you can count on: this country is going to out-produce the Axis by a wide margin. We're "all out" to end this war as soon as possible. And when it's over, we hope you can be as proud of the home folks as they are of you.

Salutes!

The fellows at Gisholt



These new Victory lathes are big Saddle Type machines: Two sizes: 21" and 24" chucks; 5¼" and 9¼" spindle bores.

GISHOLT

THIS letter may be good news to any man in the fighting forces. But it's even more to the point for the man trying to increase production capacity in vital war plants.

NEWS OF THE INDUSTRY

Illinois

J. E. WHITE, former vice-president of the R. C. Larkin Co., Chicago, Ill., manufacturer of tractor equipment, has been appointed project manager of the Kropp Forge Co. and its subsidiary — the Kropp Forge Aviation Co.—of Chicago. Mr. White will have charge of the construction of the new plant. J. H. LUND, who has been in the sales organization of the company for several years, has been appointed vice-president. BUDD H. GEBHARDT has joined the company as production engineer, and I. G. MOORE has been added to the staff as personnel promotion director.

JOHN MUNRO has recently been promoted to the position of vice-president in charge of the Procurement Division of the Whiting Corporation, Harvey, Ill. This division has recently been established to coordinate purchasing, expediting, and priorities, previously handled by separate departments.

JAMES S. HAGAN has been appointed manager of the manufacturing and repair department for the northwestern district of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. He succeeds R. E. POWERS, who is now serving as Pacific Coast district manager of the department. Mr. Hagan will be located at La Grange, Ill.

P. D. BLOCK, JR., has been elected a member of the board of directors of the Inland Steel Co., Chicago, Ill., to take the place of his father, the late P. D. Block. He is assistant to the vice-president in charge of raw materials and the Inland line of ore freighters.

STEWART-WARNER CORPORATION, Chicago, Ill., was recently presented with the Army-Navy Production Award pennant for "outstanding wartime performance." This company was one of the first of Chicago industries to convert to war production.

W. G. MCFADDEN has been appointed acting manager of the Chicago office of the Allegheny Ludlum Steel Corporation, Pittsburgh, Pa. Mr. McFadden is taking the place of P. E. FLOYD, now serving the Government.

KROPP FORGE CO., 5301 W. Roosevelt Road, Chicago, Ill., has been awarded the Army-Navy "E" pennant for excellence in production of war materials.

Michigan

WESTERN MFG. CO., Scotten and Bangor Aves., Detroit, Mich., has recently increased its facilities for making gears and transmissions for industrial and automotive uses. The engineering department now occupies a large portion of the recently added office space, and substantial additions have been made to the machine and assembly departments.

RALPH GRIFFITH, of the Chicago office of the Drive-All Mfg. Co., Detroit, Mich., has been promoted to the position of sales manager. Mr. Griffith has had twenty-five years of experience in sales, industrial, and public relations work. He succeeds C. A. COWDREY, who has been advanced to the post of general manager at the Detroit office.

TRIANGLE ENGINEERING CO. has moved into new offices at 400 E. Nine-Mile Road, Detroit, Mich., where the company, which specializes in tool engineering, will have available a floor space of 4000 square feet. The officers of the company are E. P. SAUNDERS, G. L. ATHERHOLT, SR., and C. M. SMILLIE, JR.

F. A. ENDRESS has resigned as president of the Tuff-Hard Corporation, Detroit, Mich., in order to devote more time to research and development work as the company's technical consultant. The office of the president will be unfilled temporarily.

CARL J. KENNEDY has been appointed sales manager and assistant secretary and assistant treasurer of Hydraulic Machinery, Inc., Detroit, Mich.

New England

PRODUCTION DEVICES, INC., announces the removal of its headquarters office from East Hartford, Conn., to its new plant at Poultney, Vt. The new plant provides facilities for greatly increased output of Airlox production vises.

JOHN H. COLLIER has been appointed sales manager of the Nicholson File Co., Providence, R. I., and HOWARD E. JENKINS has been made assistant sales manager. Mr. Collier has been connected with the company since 1906, and was made assistant sales manager in 1912. Mr. Jenkins entered the employ of the company in 1938 at the Philadelphia office, and in 1941 was transferred to the sales department in the Providence office.

John H. Collier, Newly Appointed Sales Manager of Nicholson File Co.

Howard E. Jenkins, New Assistant Sales Manager of Nicholson File Co.

WALLACE T. MONTAGUE has been elected a vice-president of the Norton Co., Worcester, Mass. Mr. Montague has charge of sales planning and development, and previously held the title of assistant vice-president. He has been connected with the Norton organization since 1912. R. H. LANGDON has been appointed field engineer in the Pittsburgh district by the Norton Co., and E. P. GREGORY has been made field engineer in the Chicago district.

SHAFTS OR SHELLS — *Faster!*

SUNOCO EMULSIFYING CUTTING OIL

helps machine better war materials . . . in shorter time

Whether it's shafts or shells, axles or "ack acks," Sunoco Emulsifying Cutting Oil is proving a production stimulant for all machining operations requiring an emulsifiable cutting oil.

Sunoco is increasing tool life. Exceptionally high heat-absorbing properties preserve the cutting edge of tools . . . permitting longer operating periods between tool grinds, fewer "time outs" for tool changes — more production per shift.

Sunoco is making possible greater feeds and speeds. Because of the excellent heat dissipation, increased speeds and feeds can be utilized on many operations . . . producing more pieces in shorter time . . . with no sacrifice in accuracy or finish.

Sunoco is reducing rejects. Maintenance of close tolerances, smoother finishes, fewer tool set-ups . . . all combine to cut rejects to a minimum.

Sun Doctors of Industry — experienced metal-working experts — are ready, willing and able to show you how Sunoco can speed your war production. Call one in today. For examples of how they are helping others, get your copy of "Helping Industry Help America." Write

SUN OIL COMPANY • Philadelphia

Sun Oil Company, Ltd., Toronto

LETS GO! U.S.A. KEEP 'EM FLYING!

PERFORMANCE DATA

OPERATION—Machining coupling from steel forging @ 98 R.P.M.

MACHINE — 2-L Gisholt Turret Lathe.

TOLERANCE—.001".

CUTTING LUBRICANT —1 part Sunoco to 15 parts water.

SUNOCO

SUN PETROLEUM PRODUCTS

HELPING INDUSTRY HELP AMERICA

New York and New Jersey

RUDEL MACHINERY CO., INC., 100 E. 42nd St., New York City, a newly organized firm representing machine tool builders, has recently taken over many of the machine tool lines formerly handled by Henry Prentiss & Co. The manufacturers now being represented by the company in northern New Jersey, the eastern half of New York State, and Connecticut are: Acme Machine Tool Co., Cincinnati, Ohio; Avey Drilling Machine Co., Cincinnati; Cincinnati Bickford Machine Tool Co., Cincinnati; Denison Mfg. Co., Columbus, Ohio; Gould & Eberhardt, Irvington, N. J.; Racine Tool & Machine Co., Racine, Wis.; Stearns Rogers Co., Denver, Colo., and V & O Press Co., Hudson, N. Y. THOMAS R. RUDEL, formerly vice-president of the Rudel Machinery Co., Ltd., of Montreal, Canada, is the head of the new organization. The other members of the company were all previously connected with Henry Prentiss & Co. WALTER O. GRAHAM, for thirty-six years with the Prentiss organization, and LEWIS H. PRATT, who had been with the Prentiss firm since 1927, are vice-presidents of Rudel Machinery Co. The company maintains a branch office at 7 Main St., West Hartford, Conn.

WILLIAM E. VOGT has been elected secretary of the Electro Metallurgical Sales Corporation, a unit of Union Carbide and Carbon Corporation. His headquarters will continue to be at the general offices, 30 E. 42nd St., New York City. Mr. Vogt has been connected with various units of the corporation for more than thirty years.

WILLIAM SCHWARTZ, after fifteen years of executive service with Anton Smit & Co., Inc., of New York City, importers and dealers in industrial diamonds for truing grinding wheels, has entered business for himself under the name CHAMPION DIAMOND CO. The new concern is located at 551 Fifth Ave., New York City.

BAUSCH & LOMB OPTICAL CO., Rochester, N. Y., received the Army-Navy Production Award on September 6 for exceptional achievement in the production of war equipment. This was the third time in fourteen months that the company had been honored by the armed forces for its record.

BUFFALO PUMPS, INC., North Tonawanda, N. Y., was recently awarded the joint Army-Navy Production Award for the excellent record made by the company in producing pumps for naval and merchant ships.

A. G. YORK, formerly assistant to the president and managing director of the Forged Steel Fittings Division of the Watson-Stillman Co., Roselle, N. J., maker of hydraulic machinery and equipment, has been appointed vice-president in charge of sales for the entire company. He succeeds J. C. GRINDLEY, sales manager of the Hydraulic Machinery Division, who has resigned on account of ill health. Mr. York will continue to fill the position of managing director of the Forged Steel Fittings Division, in addition to his other duties, for the present. Other appointments announced by the board of directors are: R. W. DINZL, vice-president in charge of engineering; F. H. STILLMAN, assistant to the president and assistant secretary; and WILLIAM WOIDT, assistant secretary.

Ohio

W. W. BROUGHTON, of the National Lead Co., has been transferred to the Magnesium Reduction Co., Luckey, Ohio, an affiliate of the National Lead Co., where he will be responsible for alloying and fabrication. Mr. Broughton conducted all the development work on the alloy Kirksite "A," the uses of which for dies for aircraft parts are dealt with in an extensive article in this number of MACHINERY. In his new work, Mr. Broughton will again be aiding the aircraft industry, but in a different field. The Magnesium Reduction Co. produces magnesium by means of the relatively new ferro-silicon process.

Drix Duryea, Inc.

W. W. Broughton, Now in Charge of Alloying and Fabrication for the Magnesium Reduction Co.

ACME MACHINE TOOL CO., Cincinnati, Ohio, manufacturer of turret lathes, has concluded selling arrangements in New England and New York as follows: LYND FARQUHAR CO., Park Square Bldg., Boston, Mass., will cover the states of Connecticut, Massachusetts, Rhode Island, New Hampshire, Vermont, and Maine; RUDEL MACHINERY CO., 100 E. 42nd St., New York City, eastern New York State and northern New Jersey; C. H. BRIGGS MACHINE TOOL CO., INC., Onondaga Hotel Bldg., Syracuse, N. Y., central New York and northeastern Pennsylvania; GEORGE KELLER MACHINERY CO., 1807 Elmwood Ave., Buffalo, N. Y., western New York, including Buffalo and Rochester. These companies have been appointed to take the place of Henry Prentiss & Co., whose retirement was recently announced.

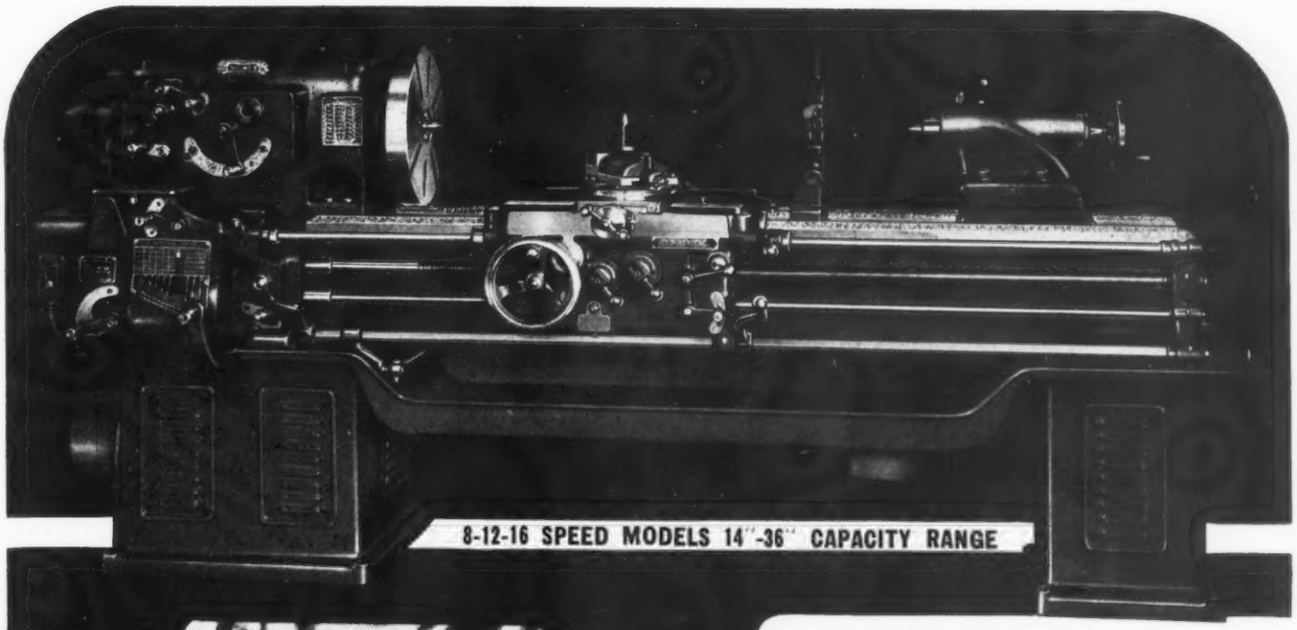
JOHN C. GARAND, inventor of the Garand semi-automatic rifle, will receive a special award from the American Society for Metals at its annual dinner on October 15, held in connection with the War Production Edition of the National Metal Exposition in Cleveland, Ohio. The rifle that is standard equipment today for both the Army and the Marines will be displayed by the Cleveland Ordnance Office in its space at the Exposition. The Ordnance display will be located in the War Conference Section of the Exposition in the South Exhibit Hall at the Cleveland Public Auditorium.

R. R. HIGGINS, formerly secretary and treasurer of the Standard Tool Co., Cleveland, Ohio, has been elected president. E. E. WEGMAN has been elected secretary, and J. W. BREMER treasurer. All these officers have been connected with the company in various capacities for thirty years. H. C. MCKEAN has resigned as general manager on account of ill health.

OHIO CRANKSHAFT CO., 3300 Harvard Ave., Cleveland, Ohio, has recently leased a two-story factory building in Cleveland, which increases by 50 per cent the floor space of the Tocco Division of the company. The great increase in output of this division, due to the wartime demand for electrical induction surface hardening and heating machines, necessitated the expansion.

IRWIN A. MARSHALL has recently joined the contact engineering staff of Foote Bros. Gear & Machine Corporation, Chicago, Ill. Mr. Marshall will represent the company in the Cleveland and northern Ohio territory. He has been connected with the power transmission field for the last twelve years in Ohio and the Central States, and is widely known in this area.

WILLIAM A. MCKINLEY, formerly chief sales engineer of the Midland Steel Products Co., Cleveland, Ohio, has been elected vice-president in



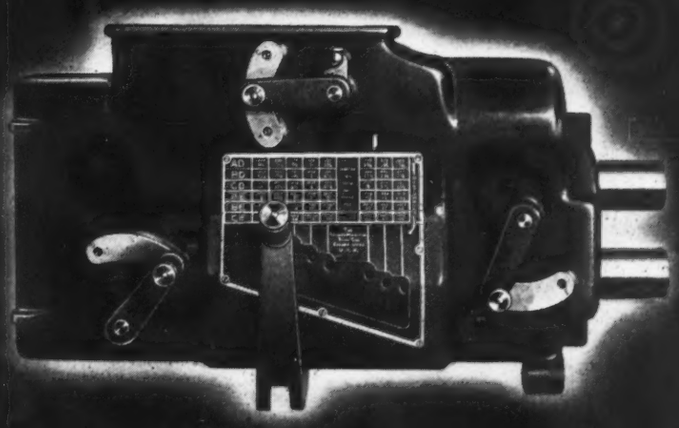
SIDNEY

THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U.S.A.

DESIGNED FOR SPEED.. BUILT TO LAST..

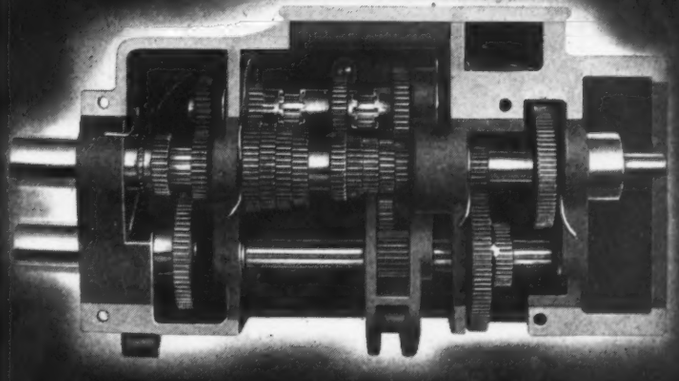
Sidney Lathes

Sidney Lathes—14" to 36" capacity range—are designed to give the utmost of production—the greatest possible versatility—and long, trouble-free life. Sidney Lathes have the stamina to stand up under the unusual production of wartime demands and stay on the job for years.



GEAR BOX

The Gear Combinations illustrated provide a range of 48 selective thread and feed changes. All shafts are mounted on anti-friction bearings and both shafts and gears are made of alloy steel, heat treated and hardened.



Complete bulletins on all models quickly available.

charge of manufacturing and sales. R. C. ARTNER, treasurer of the company, has been elected vice-president in charge of all financing and accounting. Mr. McKinley succeeds GORDON STONER, who died last August.

WILLARD S. CRANDALL has been appointed director of engineering for the Fostoria Pressed Steel Corporation, Fostoria, Ohio, succeeding LIEUTENANT RAY N. GREEN, who entered the service of the armed forces last fall. Mr. Crandall previously had charge of the product development activities of the company.

R. J. LAIDLAW has been appointed manager of the Cleveland District Office of the Worthington Pump and Machinery Corporation, Harrison, N. J. Mr. Laidlaw will succeed A. J. KLUG, who will now devote his entire time to special work.

W. J. REAGAN has been appointed melt shop research metallurgist for the Copperweld Steel Co. in Warren, Ohio. Mr. Reagan was previously connected with the Edgewater Steel Co.

SMITH TOOL WORKS, INC., 826 N. Sandusky Ave., Bucyrus, Ohio, manufacturers of surface plates, announce that the corporate name has been changed to SMITH TOOL & ENGINEERING CO.

TOWMOTOR CO. Cleveland, Ohio, manufacturer of power lift-trucks, was recently presented with the Army-Navy "E" award for outstanding performance in the production of war materials.

Pennsylvania

JOSEPH MOODY has been appointed manager of industrial relations for the York Ice Machinery Corporation, York, Pa. This is a newly established division of the company, and will be located at the West York plant. Mr. Moody's duties will embrace all phases of industrial and personnel relations for all divisions of the corporation. Mr. Moody has had a wide experience in industrial and personnel matters. Since the first of the year he has been district representative of the War Production Board, and is now a member of the War Manpower Commission; his work with the latter agency, however, will be limited from now on to special advisory duties.

C. N. KIRKPATRICK, formerly vice-president and general manager of the Landis Machine Co., Waynesboro, Pa., has been appointed president. He will continue his duties as general manager. G. M. STICKELL, sales manager, has been advanced to vice-president to succeed Mr. Kirkpatrick, and will also continue as sales manager.

Robert P. Freehafer, Newly Appointed Purchasing Agent of the Carpenter Steel Co.

ROBERT P. FREEHAFER, previously assistant purchasing agent of the Carpenter Steel Co., Reading, Pa., has been advanced to the position of purchasing agent.

ROY M. SMITH has joined the Roller-Smith Co., Bethlehem, Pa., as assistant chief engineer. Mr. Smith was formerly engineering manager for the Wiring Device Division of the Bryant Electric Co.

Washington, D. C.

CHARLES E. WILSON, president of the General Electric Co., Schenectady, N. Y., has been named vice-chairman of the War Production Board, and will act as chairman of the newly organized Production Executive Committee. Mr. Wilson has resigned his position as president and director of the General Electric Co., and will be succeeded by GERARD SWOPE as president of the company. OWEN D. YOUNG will resume his position as chairman of the board of directors.

WILLIAM L. BATT, president of S K F Industries, Inc., Philadelphia, Pa., and CHANNING R. DOOLEY, manager of industrial relations of the Socony-Vacuum Oil Co., New York, have been appointed management representatives on the Federal Committee on Apprenticeship which will advise the Federal Security Agency and the War Manpower Commission on apprentice training and related training policies.

Wisconsin and Utah

GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wis., announces the appointment of the following agents to take over the territory formerly covered by Henry Prentiss & Co.: WILSON-BROWN CO., Chrysler Bldg., 405 Lexington Ave., New York City, for northern New Jersey, Connecticut, and eastern New York State; WIGGLESWORTH MACHINERY CO., 199 Bent St., Cambridge, Mass., for the states of Maine, New Hampshire, Vermont, Massachusetts, and Rhode Island; C. H. BRIGGS MACHINE TOOL CO., Onondaga Hotel Bldg., Syracuse, N. Y., for central New York; GEORGE KELLER MACHINERY CO., 1807 Elmwood Ave., Buffalo, N. Y., for western New York, including the Buffalo and Rochester territories. The company has also established an office at 405 Lexington Ave., New York City, where its direct representative, D. M. LAFLIN, will be located. Mr. Laflin will continue to serve the customers of the company through the foregoing agents, as well as through the SWIND MACHINERY CO., of Philadelphia, Pa., and the TIDEWATER SUPPLY CO., INC., of Norfolk, Va.

TECHTMANN INDUSTRIES, INC., will be the new name of the PACK-RITE MACHINE CORPORATION, 828 N. Broadway, Milwaukee, Wis. The manufacture of the Pack-Rite machines will be continued as a division of Techtmann Industries, Inc. Since war was declared, the company has been manufacturing tools and machines for war production, in addition to its regular line of packaging machines.

WILLIAM N. GROOMS, Salt Lake City, Utah, has been appointed a district sales agent for the Roller-Smith Co., Bethlehem, Pa. Mr. Grooms will handle all Roller-Smith products in the states of Utah, Idaho, Montana, and the southwest corner of Wyoming. He will maintain offices at 630 Dooly Block, Salt Lake City.

* * *

The keystone of democracy is the individual. What he strives for, multiplied by millions, becomes the action of the group. At present, for a limited time only, we sacrifice our common ways of life; we do without our customary freedom of action. When we earn a dollar, we return much of it, instead of doing with it what we would.

The important thing is that such sacrifice might be permanent unless we ourselves shape the future otherwise. No one outside ourselves is going to try to shape it to our taste. Up to now, there has been no reliable disclosure on the part even of our own Government as to the way the future will be molded. The Government is busy; we are busy; but in the midst of doing our best for today's problems, we must take thought for tomorrow. The future begins with us. —*Courtesy Edgar T. Ward's Sons Co.*

40 MEN AND A JEEP

"GETTING there fustest with the mostest men" is still rule one for winning a battle. Today's wars depend upon the speed with which troops and their fighting equipment can be moved to the place where they are needed.

Rolling off production lines in America's great aircraft factories are huge freighters of the airways—planes as big as a boxcar that can span a continent between daylight and dark.

These leviathans of the air owe their tremendous carrying capacity as well as the speed with which they fly to the giant engines that power them.

To transmit the power of thousands of horses to whirling propeller blades, the gears in these engines must of necessity be held to such close tolerances that engineers have long considered them a laboratory product.

But laboratory methods of production could not be expected to furnish enough gears for the thousands upon thousands of fighting planes, bombers, and transports that are required to win a war.

The solution came in the production of gears of laboratory precision by mass methods, and today in the precision gear plant of Foote Bros., modern industrial might is helping solve the problem of more horsepower for engines—produced in ever-increasing quantities to meet war's insistent demands.

These new techniques—these new skills translated into post-war production mean that peacetime speed reducers and peacetime gears will assure better machines—quieter machines—that promise greater savings to American manufacturers.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard • Chicago, Illinois

FOOTE BROS.

SPEED REDUCERS * GEARS * SPECIAL ASSEMBLIES

OBITUARIES

Reginald D. MacDonald

Reginald D. MacDonald, vice-president and treasurer of the American Swiss File & Tool Co., Elizabeth, N. J., died on July 18 at the St. Francis Hospital in Jersey City, after a three weeks' illness. Mr. MacDonald was born in Nova Scotia forty-five years ago, and had been connected with the company for twelve years. He was a veteran of the first World War. He is survived by his wife, a sister, and five brothers.

Norton A. Mears

Norton A. Mears, vice-president in charge of purchases of the R C A Mfg. Co., Inc., died on August 19 in Philadelphia, Pa. Mr. Mears began his manufacturing career with the Lake Shore & Michigan Southern Division of the New York Central Railroad. Later, he coordinated the stores system of the Big Four System with that of the New York Central, when the latter took over the active operation of the Big Four road.

Subsequently, Mr. Mears was in charge of the time study, rate setting, and inspection departments of the agricultural implement plants of Sears, Roebuck & Co. He then spent five years with the Amalgamated Machinery Corporation as assistant manager in Chicago, and as manager of the open-hearth steel plant at New Cumberland, W. Va. Following that connection, he was engaged in consulting industrial engineering practice for several years. He organized and was the first president of the Alaskan Steel Co., and was vice-president and general manager of the Chicago Forging & Mfg. Co. for nearly ten years before becoming associated, in 1934, with the R C A Mfg. Co.

Mr. Mears is survived by his wife and by a brother Robert Mears.

EDWARD W. P. SMITH, consulting engineer for the Lincoln Electric Co., and a nationally known authority on arc welding, was found dead Saturday morning, September 19, in his berth aboard a train bringing him back to Cleveland from Indianapolis. Mr. Smith, who had addressed a meeting of the American Welding Society at Indianapolis Friday night, had boarded the train immediately after the meeting. His death came as a shock to his associates, as he had appeared to be in good health at the meeting.

Mr. Smith had been connected with the Lincoln Electric Co. for more than twenty years, and had traveled extensively in the last year in the interests of the war production program, conducting welding courses and giving lectures on welding. He gave advice to many war concerns utilizing welding in the construction of war equipment. He also conducted special courses at the Lincoln plant each month on designing for welding. Mr. Smith was fifty-six years old. He is survived by his wife and six children.

HAROLD C. RYDER, advertising and sales promotion manager of the Hayward Co., New York, died suddenly on August 15. Although Mr. Ryder had apparently been in excellent health, he was stricken with a heart attack in his home at Hollis, L. I., and death followed almost immediately. Mr. Ryder was born in New York City in 1893. After leaving school, he entered the employ of the Hayward Co. in 1907. With the exception of the period during which he served as a member of the United States Signal Corps in England and France, during the first World War, Mr. Ryder had been continuously connected with the Hayward Co. for thirty-five years. Besides his wife, he leaves a son Charles, and a daughter Jean, as well as a host of friends.

FRANCIS J. AREND, founder and president of the DeLaval Steam Turbine Co., Trenton, N. J., died on August 24 at the Fitkin Memorial Hospital in Neptune, N. J. Mr. Arend was also president of the DeLaval Separator Co. He was a man of exceptional ability, and all who came in contact with him were impressed by his far-seeing wisdom, able judgment, and executive ability.

EDWIN L. SMALLEY, president of the Hevi Duty Electric Co., Milwaukee, Wis., died in Milwaukee on August 29 at the age of sixty-five. Mr. Smalley was a pioneer in the electric heat-treating furnace industry, and held a number of furnace patents.

COMING EVENTS

OCTOBER 1-3 — NATIONAL AIRCRAFT PRODUCTION MEETING OF THE SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel Biltmore, Los Angeles, Calif. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

OCTOBER 7—Fall meeting of the ASSOCIATED MACHINE TOOL DEALERS OF AMERICA at the Hotel Pennsylvania in New York City. Executive secretary, Thomas A. Fernley, Jr., 505 Arch St., Philadelphia, Pa.

OCTOBER 12-14—National fall meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel Sagamore, Rochester, N. Y. C. E. Davies, secretary, 29 W. 39th St., New York City.

OCTOBER 12-16 — NATIONAL METAL CONGRESS AND EXPOSITION in Cleveland, sponsored by the American Society for Metals. W. H. Eisenman, secretary, 7301 Euclid Ave., Cleveland.

OCTOBER 12-16—Annual meeting of the AMERICAN WELDING SOCIETY at the Hotel Cleveland in Cleveland, Ohio; headquarters of the Society, 33 W. 39th St., New York City.

OCTOBER 15-17—Twenty-fifth semi-annual meeting of the AMERICAN GEAR MANUFACTURERS ASSOCIATION at Skytop Lodge, Skytop, Pa. Newbold C. Goin, manager-secretary, 602 Shields Bldg., Wilkinsburg, Pa.

OCTOBER 16-17—Tenth semi-annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS, to be known as the War Production Conference of the Society, at Springfield, Mass., with headquarters at the Hotel Kimball. Adrian L. Potter, executive secretary, 2567 W. Grand Blvd., Detroit, Mich.

OCTOBER 27-29—Thirty-first NATIONAL SAFETY CONGRESS AND EXPOSITION in Chicago, with headquarters at the Sherman Hotel. For further information, address National Safety Council, 20 N. Wacker Drive, Chicago, Ill.

NOVEMBER 24 - 29 — NATIONAL CHEMICAL EXPOSITION AND INDUSTRIAL CHEMICAL CONFERENCE at the Sherman Hotel, Chicago, Ill. For further information, address National Chemical Exposition, 110 N. Franklin St., Chicago, Ill.

NOVEMBER 30-DECEMBER 3 — Annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at the Hotel

REEVES VARIABLE SPEED DRIVES

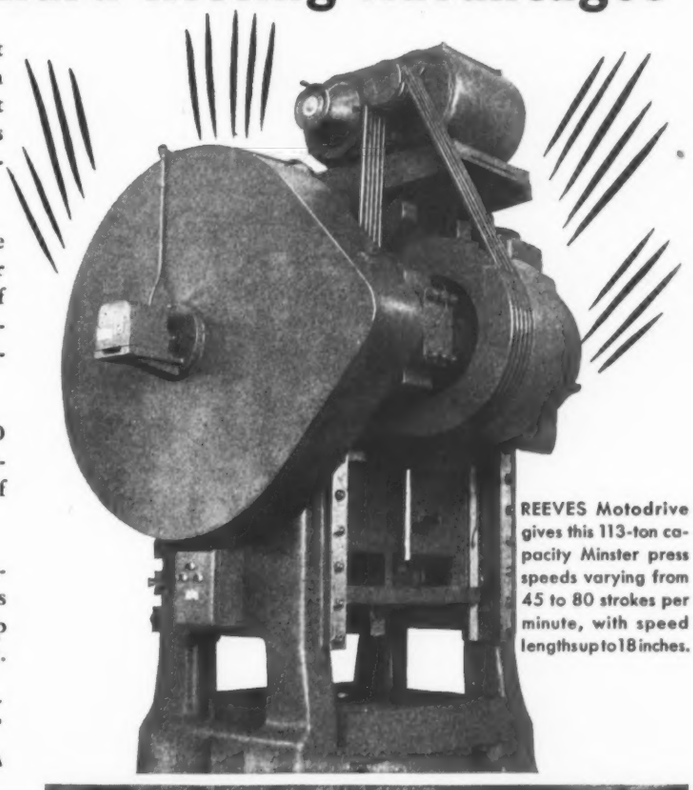
provide these Vital, Hard-Hitting Advantages

1 **FULL RANGE SPEED ADJUSTABILITY**—not just steps in speed but any speed between predetermined limits — maintained without slippage and without fluctuation as long as desired. Speed changes effected without stopping driven machine.

2 **MANY ADAPTABLE UNITS** in one complete line, providing infinite speed flexibility over a wide range and available in many types of controls—manual, electric remote and completely automatic, the latter by electrical, mechanical or hydraulic methods.

3 **OPERATING PRINCIPLE PROVED** in 210,000 installations, including use as standard equipment by builders of 1,440 different makes of machines.

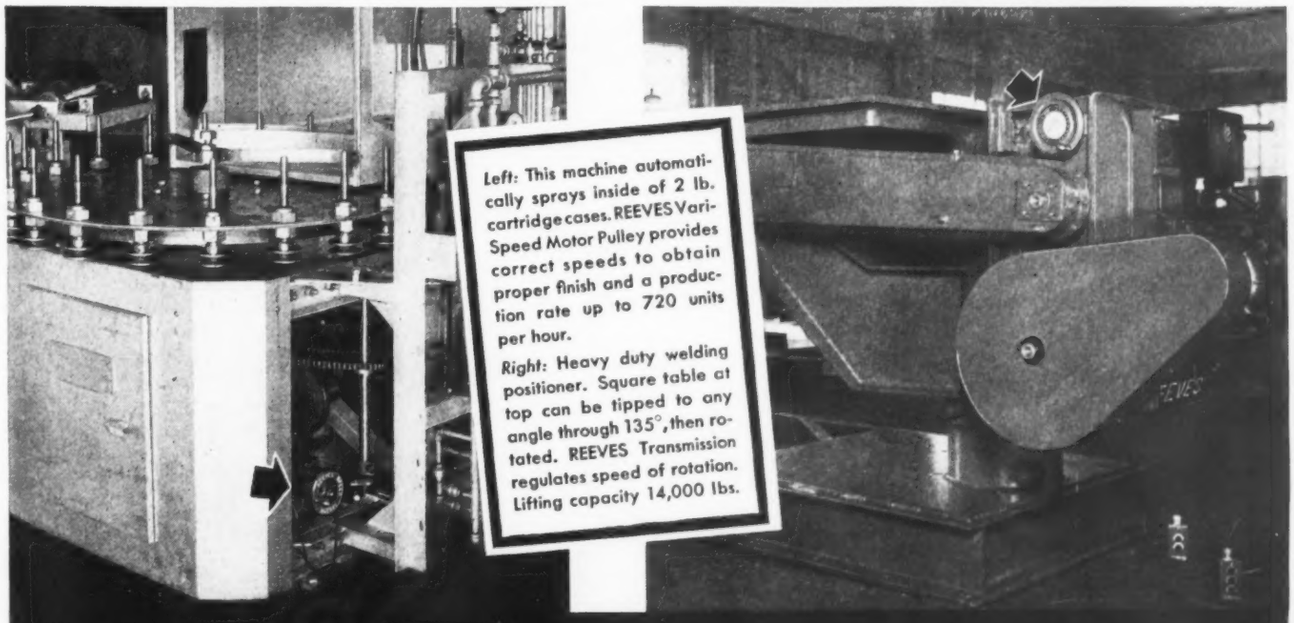
4 **NATION-WIDE ENGINEERING SERVICE,** consisting of seasoned speed control engineers located in 36 leading industrial centers to help you choose the best unit and apply it correctly.



REEVES Motodrive gives this 113-ton capacity Minster press speeds varying from 45 to 80 strokes per minute, with speed lengths up to 18 inches.

Send for copy of 20-page booklet M-423, "More Output for Victory with REEVES Variable Speed Control."

REEVES PULLEY COMPANY, COLUMBUS, INDIANA



Left: This machine automatically sprays inside of 2 lb. cartridge cases. REEVES Vari-Speed Motor Pulley provides correct speeds to obtain proper finish and a production rate up to 720 units per hour.

Right: Heavy duty welding positioner. Square table at top can be tipped to any angle through 135°, then rotated. REEVES Transmission regulates speed of rotation. Lifting capacity 14,000 lbs.

REEVES *Accurate Variable* Speed Control

Astor, New York City. Secretary, C. E. Davies, 29 W. 39th St., New York City.

NOVEMBER 30-DECEMBER 4 — Fifteenth NATIONAL EXPOSITION OF POWER AND MECHANICAL ENGINEERING at Madison Square Garden, New York. Charles F. Roth, manager, International Exposition Co., 480 Lexington Ave., New York City.

JANUARY 11-15, 1943—Annual meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Book Cadillac Hotel, Detroit, Mich. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York City.

* * *

Ten Suggestions for Carrying Out a Scrap Campaign

1. Head the campaign by appointing an able executive of the company, armed with authority to act.
2. Use posters, illustrations, pay-envelope stuffers, and all other publicity means to enlist all employes in the scrap campaign.
3. Comb plant and yards for scrap and abandoned equipment.
4. Survey all plant equipment, particularly idle, standing, or discarded machines.
5. Classify and segregate scrap and supervise its handling.
6. Make each foreman responsible for preventing spoilage and waste in his department.
7. Report promptly equipment that is obsolete. If equipment has not been used in three months, and it cannot be proved that it will be used in the next three, turn it over where it can be used—or scrap it.
8. Salvage usable parts from equipment marked for scrapping.
9. Speed return of scrap to mills and refineries through existing channels. Report regularly on collections of scrap to the Industrial Salvage Committee set up by the War Production Board in your community.
10. Enforce monthly rechecks in every department to find scrap material previously overlooked.

* * *

Meeting of Compressed Air Institute

The Compressed Air Institute held a meeting on September 10 and 11 at the Hotel Hershey, Hershey, Pa., for the purpose of interchanging ideas in an effort to speed up the output of compressed air equipment needed in connection with the war effort. The meeting was attended by forty-six executives representing the twenty-three member companies.

NEW BOOKS AND PUBLICATIONS

INDUSTRIAL MANAGEMENT. By Arthur G. Anderson, Merten Joseph Mandeville, and John Mueller Anderson. 612 pages, 6 by 9 inches; 172 illustrations. Published by the Ronald Press Co., 15 E. 26th St., New York City. Price, $4.50.

This volume may be considered a text-book for those who are preparing for the problems of tomorrow. The foundation of the book was laid in an earlier volume, "Industrial Engineering and Factory Management," and the general content of that work, which satisfactorily met the test of successful teaching of the subject in many schools, has been retained in this edition. The book covers not only the relations between management and technical problems and between management and labor problems, but also the inter-relation between industry and society as a whole.

The scope of the work is best indicated by the following list of the chapter headings: Public Relations; Distribution and Research; Industrial Progress; Scientific Management; Ownership in Relation to Management; Organization for Management; Charting the Organization; Selecting a Location; Planning the Factory Building; Construction of the Factory Building; Power and Heating; Maintenance; Materials Handling; Plant Lay-out; Industrial Lighting; Air Conditioning; Standardization and Simplification; Human Relations; The Personnel Department; Fatigue Among Workers; Motion and Time Study; Putting Standardized Methods into Practice; Wages; Budgets; Purchasing; Quality Control; Materials Control; Tool Control; Production Control; and Industrial Costs.

WELDING HANDBOOK. 1593 pages, 6 by 9 inches. Published by the American Welding Society, 33 W. 39th St., New York City. Price, $6 in the United States; $6.50 elsewhere.

With the growing importance of welding as a war production and industrial tool in the construction of ships, tanks, planes, guns, and machinery, this handbook will meet a widespread need for up-to-date information in concise form on the subject of welding. In its preparation, some 270 men experienced in the welding art have cooperated. The volume has been prepared to cover, first, the physics and metallurgy of welding and the weldability of different kinds of steel; second, the welding and allied processes; third, the materials used; fourth, training, inspection, and safety; fifth, design considerations and tests of welding; and, sixth, applications of welding.

In preparing the book, efforts were made to insure that the statements would be accurate and recommendations authoritative. To this end, outstanding authorities in each field acted as members of committees for the respective chapters. The text of the volume is arranged in handbook style; nevertheless, the material has been arranged in logical sequence and with sufficient explanatory matter so that it may be conveniently used as a text-book in engineering schools and as a reference book in trade schools and in industry.

PLASTICS. By J. H. DuBois. 295 pages, 5 1/2 by 8 1/2 inches, numerous illustrations. Published by the American Technical Society, 58th St. at Drexel Ave., Chicago, Ill. Price, $3.

The author of this book, who is connected with the plastics department of the General Electric Co., has endeavored in this treatise to convey basic and useful knowledge concerning plastic materials — their history, origin, and raw material sources; their physical, chemical, and electrical properties and limitations; the methods of their fabrication; and essential information concerning the design of products to be made from plastics. The book is divided into fourteen chapters as follows: An Introduction to Plastics; Phenolic Plastics; Urea and Amino Plastics; Cellulose Plastics; Acrylic, Vinyl, and Styrene Plastics; Cast Phenolic and Protein Plastics; Other Plastic Materials; Cold-Molded Plastics and Shellac; Laminated Plastics; Compression and Transfer Molding; Injection Molding and Continuous Extrusion; Finishing and Decorating Plastic Products; Selecting Materials for Molded Products; and Design of Molded Products.

MATERIALS TESTING AND HEAT-TREATING. By William A. Clark and Brainerd Plehn. 132 pages, 6 by 9 inches. Published by Harper & Brothers, 49 E. 33rd St., New York City. Price, $1.75.

This text-book is one of a series developed at the Rochester Athenaeum and Mechanics Institute as part of its program for developing teaching material that is practical in nature and closely related to the requirements of

PRESENTATION OF THE ARMY-NAVY AWARD TO THE BULLARD COMPANY, AUGUST 24, 1942

PROGRAM OF PRESENTATION

MASTER OF CEREMONIES ★ *Announcement* ★ GEORGE S. HAWLEY ★ *President of the Bridgeport Gas Light Company*

NATIONAL ANTHEM . . . . . Grace Moore

POSTING OF COLORS . . . Color Guard, Bullard Guards

MASTER OF CEREMONIES . . *Remarks*, George S. Hawley

INTRODUCTION of . . . . . *Honorable* Jasper McLevy

ADDRESS . . . . . *Honorable* Jasper McLevy
Mayor of Bridgeport

INTRODUCTION of Colonel F. H. Payne
Assistant District Chief of Springfield Ordnance District Representing the War Department

PRESENTATION OF ARMY-NAVY PENNANT . Colonel F. H. Payne

MASTER OF CEREMONIES ANNOUNCES RAISING OF PENNANT

RAISING OF ARMY-NAVY PENNANT
Color Guard, Bullard Guards
Ordnance Song by Veterans of Foreign Wars' Band

INTRODUCTION of E. P. Bullard . . . . George S. Hawley

ACCEPTANCE OR ARMY-NAVY PENNANT
E. P. Bullard, *President of The Bullard Company*

INTRODUCTION of *Lieutenant-Commander* R. T. Fish

PRESENTATION OF ARMY-NAVY BUTTON
Lieutenant-Commander R. T. Fish
Lieutenant-Commander U.S.N.R.

INTRODUCTION of Vincent Hughes . . *Employee Representative*

ACCEPTANCE . . . . . Vincent Hughes
President Bullard War Service Club

AMERICA . . . . . Veterans of Foreign Wars' Band

various jobs in industry. The purpose of this book is to offer a series of laboratory exercises on materials testing and heat-treating typical of commercial tests. Among the tests covered under the section Materials Testing are tensile, shear, torsion, hardness, fatigue, ductility, impact, etc. In the Heat-Treating section, the procedure and apparatus required for open-flame hardening, determining critical points in steel, microscopic examination, carburizing, cyaniding, hardening and tempering, etc., are described.

METALLURGY. By Carl G. Johnson. 262 pages, 5 1/2 by 8 1/2 inches. 127 illustrations. Published by the American Technical Society, 58th St. at Drexel Ave., Chicago, Ill. Price, $2.50.

This text-book, the author of which is assistant professor of mechanical engineering at the Worcester Polytechnic Institute, has been prepared to present information on the subject of metals in such a way that the average reader who has had no opportunity to study the subject in a detailed manner will be able to obtain a working knowledge of the manufacture and behavior of metals and their alloys. The scope of the book does not allow a complete discussion of the many phases of the science of metallurgy, but an attempt has been made to present the guiding principles in a practical way. The book, therefore, has been planned to serve merely as an introduction to the science of metallurgy, and as such it appears to serve its purpose exceptionally well.

MACHINE SHOP PRACTICE. By Sherman B. Hagberg, in collaboration with Murlan S. Corrington and Raymond M. Biehler. 311 pages, 8 by 11 inches. Published by Harper & Brothers, 49 E. 33rd St., New York City. Price, $2.50.

This text-book is one in a series developed by the Rochester Athenaeum and Mechanics Institute, Rochester, N. Y., as part of its program for developing teaching material practical in nature and closely related to the actual requirements of industry. In the preparation of the book, a committee of technically trained men from industry acted in an advisory capacity to the authors. The material presented has been evolved through ten years of actual use in the machine shop of the Rochester Athenaeum and Mechanics Institute. It is specifically intended as a trade school text-book. The contents are mimeographed and bound by wire stitching.

PLANT PROTECTION. By E. A. Schurman. 148 pages, 5 by 7 1/2 inches. Published by the Cornell Maritime Press, 350 W. 23rd St., New York City. Price, $2.

The author of this book is chief of protection of the Glenn L. Martin Co., and, hence, is well versed in the details of the subject dealt with. Briefly, the book covers selection of personnel, character investigation, organization plan, women guards, records and forms, equipment, training, firearms and ammunition, personnel conduct, reports and records, identification badges and cards, control of personal articles, passes, inspection of automobiles and trucks, handling of visitors, fires, building patrols, physical aids to protection, building inspection reports, espionage and sabotage, cranks and crank letters, as well as many other subjects. The instructions are brief and to the point.

GENERAL TRADE MATHEMATICS. By E. P. Van Leuven. 575 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York City. Price, $3.50.

This book was written to meet the need for a course of instruction for students who later will specialize in some branch of factory work. It was prepared by a man of long experience in teaching high school and junior college students. This text-book is comprehensive, and appears well adapted for a school text-book. It covers a great many practical topics, supplemented by over 3000 exercise problems selected from practical work. These give sufficient practice for the average student, so that he will become thoroughly at home with the different subjects covered. The book can also be used for home study and as a reference book.

PLANE TRIGONOMETRY MADE PLAIN. By Albert B. Carson. 389 pages, 5 1/2 by 8 1/2 inches; 197 illustrations. Published by the American Technical Society, 58th St. at Drexel Ave., Chicago, Ill. Price, $2.75.

In this text-book, the author of which is instructor of mathematics at the Louisiana State University, the essentials of plane trigonometry are covered in greater detail than in most text-books. Much attention has been given to actual numerical examples, and emphasis is placed on the application of trigonometric principles in the solution of everyday problems. The author has made an effort to arrange the information in the most effective manner for the use of students who are interested primarily in the practical application of the subject. Many exercise problems are included.

THE THEORY AND PRACTICE OF JOB RATING. By M. F. Stigers and E. G. Reed. 154 pages, 5 by 7 1/2 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York City. Price, $1.75.

This book deals with the important subject of fixing compensation of labor in relation to services rendered. The contents of the book can best be indicated by listing the various chapter headings as follows: The Place of Wages in an Economics of Abundance; The Theory of Wage Calculation; Illustration of Basic Principles; Job Elements and Their Definitions; Questionnaires and Rating Scales; Cross-Comparison Procedure; Recording the Calculation Details; Preparing the Conversion Table; and Uses of the Final Results.

ENGINEERING QUESTIONS AND ANSWERS. 176 pages, 7 1/4 by 9 1/2 inches. Published by Emmott & Co., Ltd., 78 Palatine Road, Manchester, 20, England. Price, 6/.

This is the third volume of a series of books containing a record in permanent form of selected answers from the questions and answers section of the *Mechanical World*. The questions cover a wide range of subject matter, a detailed index being included to aid in finding the particular problem in which the reader is interested. The value of this collection lies in the fact that the questions all arose originally out of the problems encountered by engineers in the course of their work.

HOW TO CONDUCT CONFERENCES. By Alfred M. Cooper. 191 pages, 5 by 7 1/2 inches. Published by the McGraw-Hill Book Co., 330 W. 42nd St., New York City. Price, $1.75.

This book outlines the principles and technique of conducting conferences, based on experience in leading thousands of conferences. It gives explicit directions for arousing thought, drawing out suggestions and ideas, and leading groups to make the best use of their experience in constructive action. The principles stated are applicable to any type of conference.

AIRCRAFT-ENGINE TROUBLE-SHOOTING CHART. Arranged by Andrew Wallace, Crew Chief, Eastern Air Lines, Inc. Published by the Norman W. Henley Publishing Co., 17 W. 45th St., New York City. Price, 75 cents.

This reference chart, based on years of practical experience, is arranged so that anyone can easily trace engine troubles and learn the proper way to correct them. The chart tells how to diagnose the troubles and remedy them through the medium of sound.

THE CARE AND OPERATION OF A LATHE. 103 pages, 4 1/2 by 7 1/2 inches. Published by the Sheldon Machine Co., Inc., Chicago, Ill. Price, 50 cents.

This booklet, written for the apprentice or student machinist, covers the modern back-geared, screw-cutting

Grind Quicker... Grind Smoother

ON EVERY WAR-TIME JOB WITH THESE

SKILSAW TOOLS!

Here are FIVE kinds of SKILSAW TOOLS you shouldn't be without, if you want to *speed* your finishing operations, *reduce* waste and *increase* your output in war production. Do you have welds to grind down? Stainless steel or brass sheets to polish? Castings to clean? Small machine parts to finish? There's a SKILSAW TOOL for each of these operations . . . and the job will get done quicker and better and at lower cost.

These SKILSAW GRINDERS and SANDERS are typical of the entire line of SKILSAW TOOLS—designed to deliver results under today's stepped-up conditions, built to stand hard usage without time-wasting breakdowns. Look into America's busiest war-work plants and you'll see SKILSAW TOOLS on the job. Ask your distributor for a demonstration and you'll see why!

NEW!

SKILSAW PORTABLE GRINDERS

Just introduced to speed up production on every war-time job...grinding down rough welds, smoothing welding beads, cleaning metals, filing, buffing and polishing on every metal surface. Two Models.

SKILSAW PORTABLE ELECTRIC TOOLS

★ MAKE AMERICA'S HANDS MORE PRODUCTIVE ★

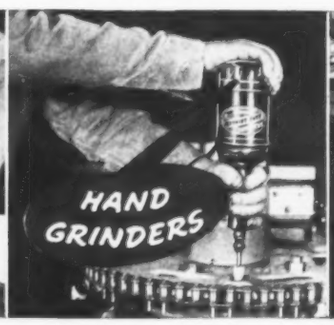
SKILSAW, INC.
5039 Elston Avenue, Chicago
New York • Boston • Buffalo • Philadelphia • Cleveland • Detroit
Indianapolis • St. Louis • Kansas City • Atlanta • New Orleans
Dallas • Los Angeles • Oakland • Seattle • Toronto, Canada

Sanding stainless steel to a perfect finish is faster with SKILSAW Disc Sanders. Also remove waste metal, buff and polish on flat or curved surfaces.

SKILSAW Belt Sanders speed up all "final-finishing" on flat surfaces of bronze, brass and all sheet metals. Quickly remove paint and varnish.

SKILSAW Hand Grinders are swifter, better on all grinding of jigs, dies and for precise finishing on intricate machines and castings.

Spotted conveniently throughout the plant, SKILSAW Bench Grinders speed production, keep tools and twist drills sharper . . . grind small parts quicker.



lathe—its parts and their functions; oiling and proper care of a lathe; the grinding of cutters; modern lathe tools; holding the work; and the performance of basic lathe operations.

MANAGEMENT'S PERSONNEL RESPONSIBILITY FOR ALL-OUT WAR EFFORT. 77 pages, 6 by 9 inches. Published by the Engineering Extension Department of Purdue University, Lafayette, Ind., as Extension Series No. 54.

This pamphlet contains the proceedings of the personnel and industrial relations conference held at Purdue University on May 15 to 16.

A PHOTOELASTIC STUDY OF STRESSES IN GEAR-TOOTH FILLETS. By Thomas J. Dolan and Edward L. Broghamer. 44 pages, 6 by 9 inches. Published by the University of Illinois, Urbana, Ill., as Bulletin Series No. 335 of the Engineering Experiment Station. Price, 45 cents.

BLUEPRINT READING FOR THE METAL TRADES. By W. A. DeVette and D. E. Kellogg. 132 pages, 8 1/4 by 11 inches. Published by the Bruce Publishing Co., 540 N. Milwaukee St., Milwaukee, Wis. Price, $2.50.

DEFINITIONS OF WELDING TERMS AND MASTER CHART OF WELDING PROCESSES. 32 pages, 6 by 9 inches. Published by the American Welding Society, 33 W. 39th St., New York City. Price, 40 cents.

STANDARD METHODS FOR MECHANICAL TESTING OF WELDS. 25 pages, 6 by 9 inches. Published by the American Welding Society, 33 W. 39th St., New York City. Price, 40 cents.

HOW TO CUT SCREW THREADS IN THE LATHE. 21 pages. Published by the South Bend Lathe Works, Department M2, South Bend, Ind., as Bulletin No. 36-A. Price, 10 cents.

* * *

Burn Another Inch and Build Another Ship

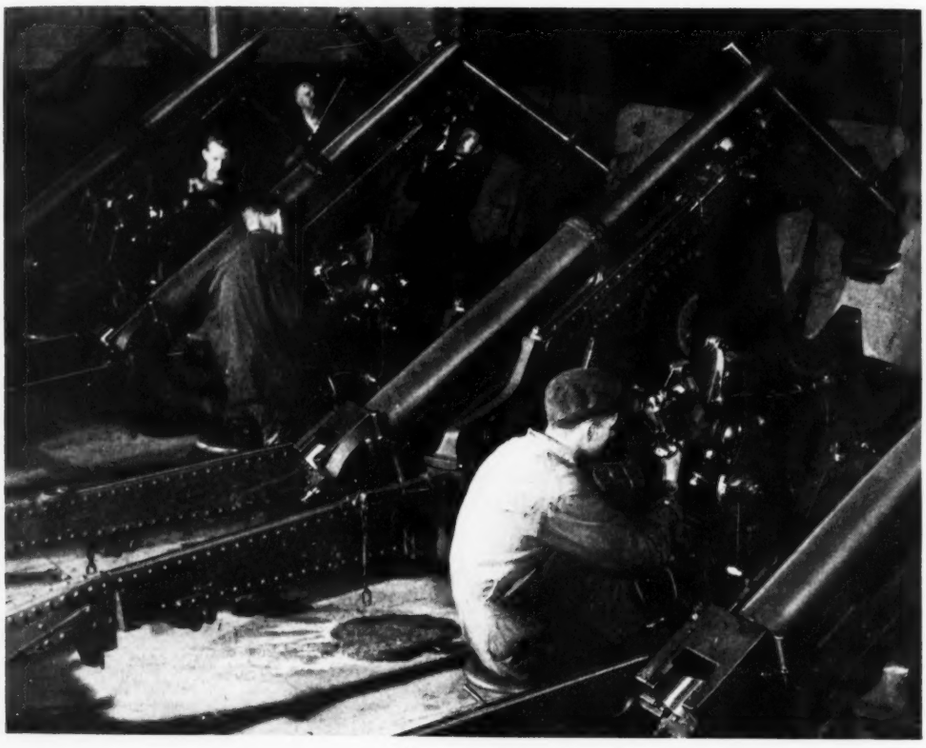
"So vital is arc welding to America's shipbuilding program," says A. F. Davis, vice-president of the Lincoln Electric Co., "that failure to use the last available 4 inches of a welding electrode stub means a loss of twenty-five ships a month. Although every 14-inch electrode can be burned down to a 2-inch stub, or even less, workmen often throw these electrodes away when they are over 3 inches long, and in some cases, it has been found that they are discarded when 6 inches long." According to Mr. Davis, an easy slogan to remember is, "Burn another inch and build another ship."

Maintenance Manuals for Contour Sawing Machines

Continental Machines, Inc., Minneapolis, Minn., manufacturers of DoAll contour sawing machines, are distributing a "library" of maintenance manuals designed to assist the users of contour sawing and filing machines to get the most efficient results from these machines. These manuals are distributed with every machine placed with the Government and with industrial concerns. Special pamphlets have been prepared for the purchasing department, the engineering department, and plant superintendents. Among the books available is the "Contour Sawing Handbook" containing 158 pages, showing hundreds of applications for contour machining in all classes of industry. A special "Operator's Instruction Manual" is available to plant superintendents.

* * *

A new synthetic known as "Haydenite," which is replacing rubber in army raincoats and is expected to replace rubber in many other products using waterproofed fabric, is announced by the Stanley Chemical Co., East Berlin, Conn. This material has been developed from the plastic used in making safety glass, of which there was a surplus when the manufacture of automobiles was stopped.



Twenty - five - pounder Gun Howitzers Assembled in a Factory in Australia from Parts Made in Plants in Different Sections of the Empire. Complete Interchangeability Permits Assembly of the Parts without Fitting

The Tool of Peace goes to War....

The iron or "trade" tomahawk—trade mark of Genesee products—was the first real contribution to better tooling in this country, being used as a general purpose tool by the peaceful Senecas of Je-nis-hi-yeh.

Last month alone . . . Genesee delivered more "Tomahawk" Quality cutting tools to Industry for the war effort than it produced in the entire year of 1939.

YET, GENESEE TOOL COMPANY is not a "war baby". It was incorporated in 1934 to supply the needs of automotive companies in Detroit, in Lansing, in Flint, in Pontiac. . . . Growth through the first years was purposely gradual. In those first years Genesee acquired and developed an organization second to none in the designing and production of cutting tools.

In recent years Genesee's growth has been accelerated. Its original plant was expanded, re-equipped with the most modern of tool production equipment available . . . a second plant was acquired and equipped . . . a corps of trained field representatives was appointed, covering virtually every major industrial center.

Today it ranks as one of the most modern tool companies in the country, producing practically every type of tool used in industry . . . H.S.S. and carbide . . . standard and special . . . for turning and forming, reaming and counterboring and milling, etc.

We will be glad to send you a streamlined condensed catalog of Genesee tools. Ask for catalog No. GT-42M.

GENESEE TOOL COMPANY

FENTON, MICHIGAN

★ *Registered Trade Mark*

Classified Contents of this Number

Aircraft Manufacture and War Production

Cartridge Links for Machine Guns and Automatic Rifles—*By Freeman C. Duston* 123

Rolled and Cast Kirksite in Airplane Plants—*By William W. Broughton* 139

Automobile-Body Stamping Plant Builds Boring Mills for Tank Production 149

Rifling Machine-Gun Barrels by Broaching 157

The Douglas Blackout Plant Builds for Victory—*By Ray A. Steinbauer* 170

Machine Tool Industry Honored by Army-Navy Awards 212

Silver Used for Aircraft Engine Bearings 214

Grinding Rifle Drills 214

Ten Suggestions for Carrying Out a Scrap Campaign 226

Design, Fixture and Tool

Milling Machine Attachment for Threading Short Plugs 167

Gaging Set-Ups of the Fixture Type—*By F. Server* 168

Design, Machine

Overload Feed-Trip Mechanism for Lathes 163

Friction-Drive Mechanism Designed for Stepless Speed Variation 163

Machine for Straightening Fine Wire 164

Simpler Machine Tools Advocated by Prominent English Manufacturer 169

Management Problems

The Tool Engineer's Place in Modern Industry .. 147

Too Much Regulation is Seldom a Sign of Efficiency 162

Fair Play is All that Industry Asks of Government 162

Well Defined Labor Policy Essential to Successful Conduct of War 184

Preventing Waste and Spoilage in Manufacturing Operations 185

Machine Tools Completely Wired before Installation 190

Materials, Metals, and Alloys

Standards Developed by the American Society for Testing Materials 148

"Kut-Kost"—a New Metal-Cutting Alloy 159

Condensed Review of Some Recently Developed Materials 174

An Unusual Application for Silver 210

Meetings and Expositions

The Twenty-Fourth Annual National Metal Exposition 173

Meeting of Compressed Air Institute 226

News of Industry

Harold V. Coes Elected President of A.S.M.E. ... 154

Engineering News Flashes 160

Machine Tool Production Reaches New Record Level 184

Lodge & Shipley Completes Fifty Years of Lathe-Building 189

Prize Award in Compressed Air Institute Competition 216

Shop Practice

Special Equipment Increases Production of High-Speed Assembly Press 148

Normalizing Castings 164

Care and Maintenance of Portable Pneumatic Tools 165

Milling Annular Rings for Locomotive Piston-Rods 185

Cemented-Carbide Tipped Tools Increase Efficiency in Railroad Maintenance Shops 186

Machining Cones and Cups for Railway Roller Bearings 190

Shop Equipment News 195

Redesign of Forged Parts Results in 40 Per Cent Increase in Machining Output 210

Planer with Reciprocating Tool-Head 216

Training for War Work

Training Machine Tool Operators 190

Victory Training Film Program to be Extended .. 214

Welding Practice

"Heliarc"—A Process for Magnesium Welding ... 188

Burn Another Inch and Build Another Ship 230